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Massachusetts Barrier Beaches

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Massachusetts Coastal Zone Management

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Acknowledgements

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December 1982

Massachusetts Barrier Beach Inventory Project

Identification Methodology

December 1982

INTRODUCTION

Executive Order No. 181 for Barrier Beaches

Barrier beaches are dynamic, hazard-prone coastal landforms on which extensive storm damage has occurred in Massachusetts. Within barrier beach areas large expenditures of taxpayers' dollars have been made for disaster recovery after major storms. In many instances taxpayers' money has been used to encourage more development, thereby multiplying the losses after future storms. To end this cycle of responding to storm damage by putting more money into disaster-prone barrier beach areas, Executive Order No. 181 (Appendix A-2) was issued.[1] This order discourages further development on barrier beaches by limiting state and federal funding for new support facilities, such as sewer and water lines and coastal engineering structures; clarifies state wetland policy for managing the natural characteristics of these areas; gives priority status for relocation assistance to storm damaged barrier beach areas; and encourages public acquisition of barrier beaches for recreational purposes.

Purpose of Project

This report describes the Massachusetts Barrier Beach Inventory Project, the purpose of which is to identify and delineate on topographic maps all of the State's barrier beaches. Other barrier beach lists have been published for Massachusetts[2], but these were very limited in scope. Only the larger more obvious barriers were included in these earlier efforts. This project represents the first comprehensive mapping project of 681 barrier beach management units in Massachusetts. This inventory will serve as the State's baseline for management purposes.

INTRODUCTION

BARRIER BEACH DEFINITION AND CHARACTERISTICS

DEFINITIONS

The criteria used for identifying and delineating the barriers are based on the definition of a barrier beach as contained in the Preamble of Executive Order No. 181. This definition of a barrier beach is also identical to the one in the Coastal Regulations of the Wetlands Protection Act (M.G.L., c. 131 s40):

> A barrier beach is a narrow low-lying strip of land generally consisting of coastal beaches and coastal dunes extending roughly parallel to the trend of the coast. It is separated from the mainland by a narrow body of fresh, brackish or saline water or marsh system. It is a fragile barrier that protects landward areas from coastal storm damage and flooding. (310 CMR 10.29).

Since coastal beaches and coastal dunes make up a barrier beach, it is important to understand the Coastal Wetlands regulatory definitions for these resource areas which are as follows:

> "Coastal beach" means unconsolidated sediment subject to wave, tidal and coastal storm action which forms the gently sloping shore of a body of salt water and includes tidal flats. Coastal beaches and tidal flats extend from the mean low water line landward to the duneline, coastal bank line or the seaward edge of existing man-made structures, when these structures replace one of the above lines, whichever is closest to the ocean (310 CMR 10.27).

"Coastal Dune" means any natural hill, mound or ridge of sediment landward of a coastal beach deposited by wind action or storm overwash. Coastal dune also means sediment deposited by artificial means and serving the purpose of storm damage prevention or flood control. (310 CMR 10.28).

GENERAL CHARACTERISTICS

To map barrier beach areas for management purposes, general criteria were developed from these regulatory definitions as follows:

(1) narrow low-lying strip of land

Barrier beach landforms are generally low-lying and narrow in width due to their geologic origin and evolution. The width and height of a barrier beach varies due to numerous factors including sediment supply, sediment transport patterns and rates, exposure to waves and human alterations. In Massachusetts, barrier dimensions range in width from over hundreds of feet to those on the order of tens of feet.

(2) consist of coastal beaches and coastal dunes

Coastal beaches and coastal dunes are formed by coastal processes such as wave, tidal and coastal storm action. Their existence is very important and it in part distinguishes barrier beach landforms from other coastal landforms that make up the Massachusetts coast. Unaltered dunes may range in height from a few feet above sea level to over fifty feet in elevation. As a result of filling, construction or structural stabilization, many barrier beaches have heavily altered beach and dune areas. These areas

are still important buffers that help protect landward areas from storm damage and flooding. Regardless of the type of alterations that have occurred, the beach or dune deposits, if not their forms, continue to exist. Consequently, developed barriers are protected by the Massachusetts Wetlands Protection Act and have been mapped as beach areas in this Project. Most other coastal landforms in Massachusetts consist entirely of bedrock, glacial sediment or artificial fill material. These other areas are not barrier beaches but may be classified as another type of coastal wetland such as rocky intertidal shore or coastal bank.

(3) parallel to the trend of the coast

The mainland Massachusetts coast is quite irregular due to a non-uniform distribution of primary coastal deposits (glacial landforms and bedrock). Barrier beaches fill irregularities in the primary deposits, and they are generally oriented perpendicular to the direction of maximum wave fetch. Consequently barrier beaches are parallel to the trend of the coast, but, since the coast is so irregular, barrier beach orientation is likewise variable.

(4) separated from the mainland by a wetland or waterbody

The definition of a barrier beach also clearly states that the landform is ". . . separated from the mainland by a narrow body of fresh, brackish or saline water or marsh system." It is an important characteristic of a barrier beach that such a marsh or water body exist landward of the barrier.

(5) a barrier beach may be joined to the mainland at one or both ends

At the lateral boundaries the barrier beach "ends" where there is no longer a wetland or waterbody behind the landform and when a glacial, bedrock or fill upland is encountered (Figure 1). The barrier may also terminate at a water body, marsh or inlet. If one end terminates in this manner, the barrier is called a barrier spit. If both ends terminate this way, it is called a barrier island. Bay barriers, which are the most common barriers found in Massachusetts, occur when both margins are attached to upland areas.

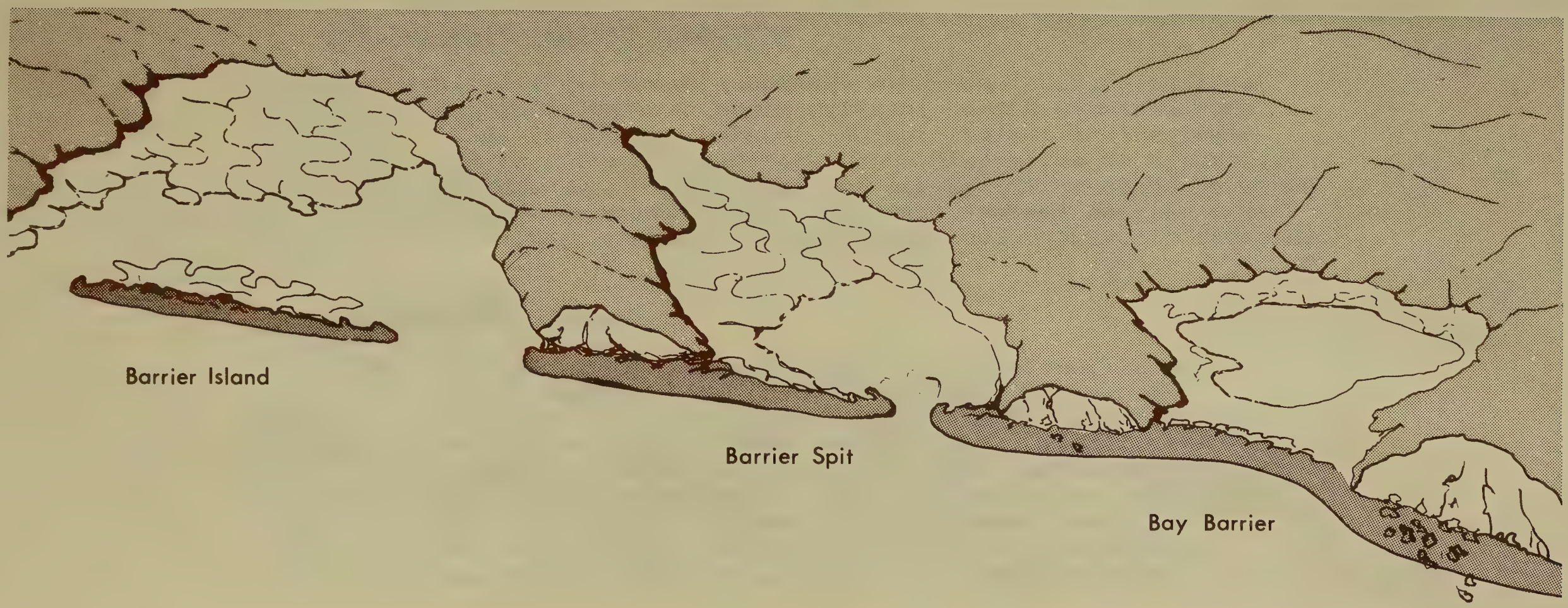


Figure 1. Types of Barrier Beaches

(6) developed barrier beaches

Neither the Executive Order nor the definition of a barrier beach imply that altered barrier beaches should be identified or designated with any special status. Also, the Order does not indicate that a landform must be above any specific size threshold to be considered a barrier beach. Whether small or large, developed or undeveloped, these coastal barriers remain subject to significant storm damage. Therefore, if a landform meets the geomorphic requirements it is identified as a barrier beach regardless of size and degree of alteration (i.e., development).

(7) artificially created landforms

Entirely artifically created landforms with some characteristics similar to a natural barrier beach exist along the Massachusetts coastline. These features, however, do not reflect the geologic evolution necessary for the landform to be classified as a barrier beach nor do these artificial landforms necessarily respond to storm processes in the same manner that a naturally formed barrier does. An example of such a structure is the Stoney Point Dike, in Buzzards Bay.

(8) perched barrier beaches

In certain coastal areas, beach and dune deposits overlie an irregular glacial surface. If the glacial landform extends above mid-tide, the overlying beach and dune resource areas are not mapped as barrier beach. When the underlying glacial surface only extends to a mid-tide elevation these landforms are identified as barrier beach units. This criterion was selected because it could be applied to most coastal areas through a combination of aerial photo use and direct field observation. Also these identified "perched barriers", as named in this

study, provide storm damage protection and flood control. Overwash fans are present on several of these perched barriers indicating that these landforms are dynamic and potentially storm hazard areas.

(9) influenced by regular tidal action

All the barrier beaches influenced by tidal action are mapped, even small barriers in coastal embayments. If the landform is large enough to consist of a coastal dune, then it is mapped as a barrier beach because it satisfies the wetland definitions. Depositional features in areas not subject to tidal influences or only subject to tidal action episodically (such as in ponds occasionally opened to the sea) are not identified as a barrier beach, because they do not satisfy the regulatory definitions.

DELINEATION OF BARRIER MARGINS

The margins of a barrier beach include the seaward (exposed) side, the landward (protected) side and lateral margins. These margins are represented by a solid line on the barrier beach maps, with the following exception. When low tide (tidal flats) extends a great distance from the dunes of the barriers, the seaward and landward margins of a barrier are represented as a dashed line on maps. This was done to simplify the graphic presentation; by definition the actual margin is still low tide in tidally influenced areas.

The lateral margins of barrier beaches encountered in Massachusetts include upland margins and water body or wetland margins. The water body or wetland margin is usually a straightforward determination. The upland/barrier beach margin delineation, however, can be quite difficult to determine. Therefore, this delineation will be discussed in detail. There are three basic types of barrier/upland margin: (1) coastal bank, (2) dune-upland, and (3) bedrock.

(1) coastal bank margin

Most of the barriers identified in this inventory are bay barriers with coastal bank lateral margins. This boundary is shown in Figure 2. In most instances in Massachusetts, coastal banks consist of glacial sediment which were formed by the last major ice advance over New England. These deposits are variable in composition and texture. They may consist of glacial till, glacial outwash or glacial lake or marine deposits. In Figure 2a, Wf-3 is an example of a coastal bank/barrier beach margin.

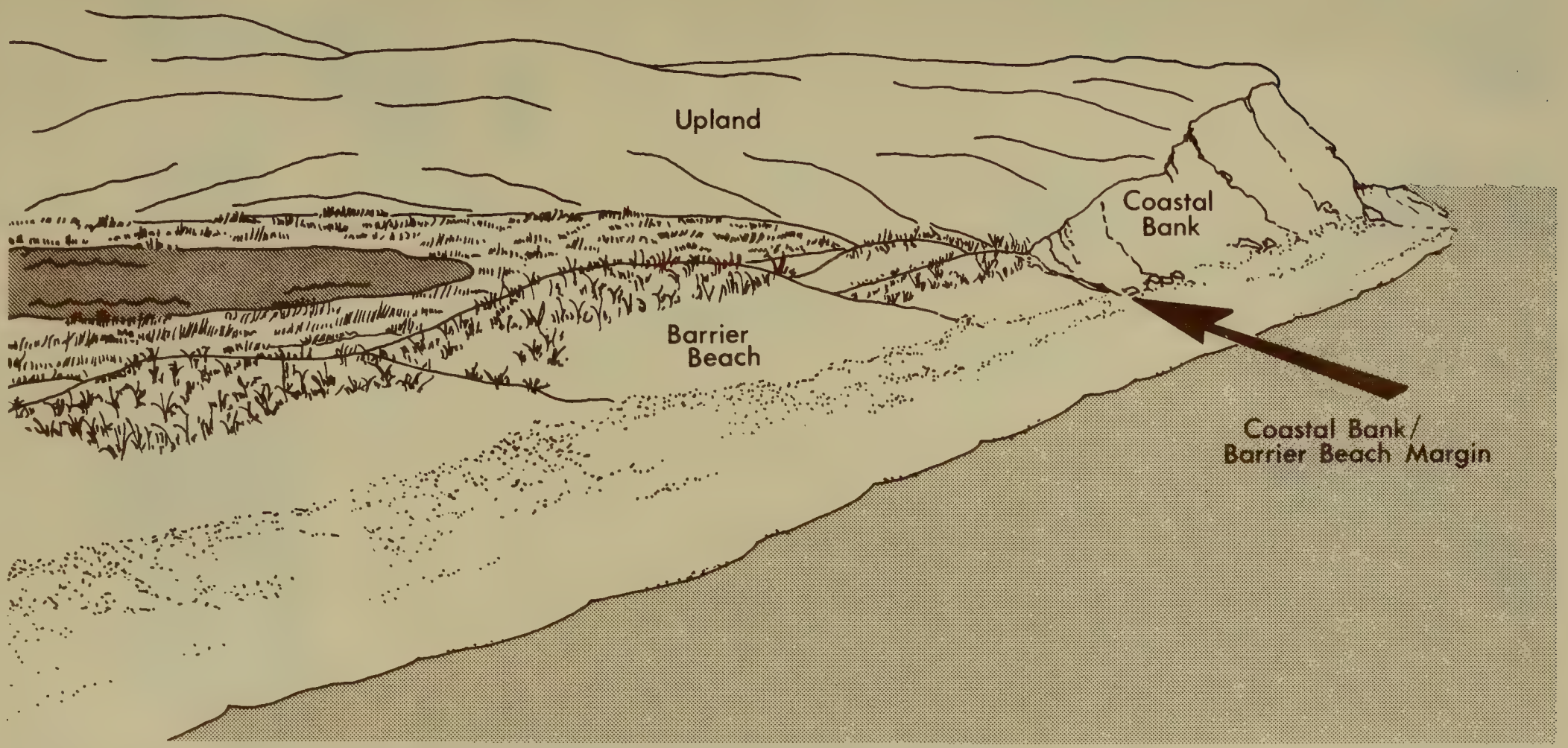


Figure 2. Coastal Bank/ Barrier Beach Margin

Figure 2a. Example of Coastal Bank/Barrier Beach Margin

Wellfleet Quad.

(2) dune-upland margin

This boundary, which is shown in Figure 3, occurs when coastal dunes are present on top of or seaward of an upland. The upland may consist of glacial material, bedrock or artificial fill. The dune-upland margin can form when a barrier beach builds laterally in front of an upland or when a barrier migrates landward and attaches itself to an upland. This margin also occurs when the landward marsh or water body behind a barrier has changed to upland as a result of artificial filling of a portion of the marsh/wetland area. Examples of this type of margin are shown in Figures 3a and 3b. The former, Tr-4, is a coastal dune area in front of a glacial upland and the latter, Mf-3, is a coastal dune in front of filled upland.

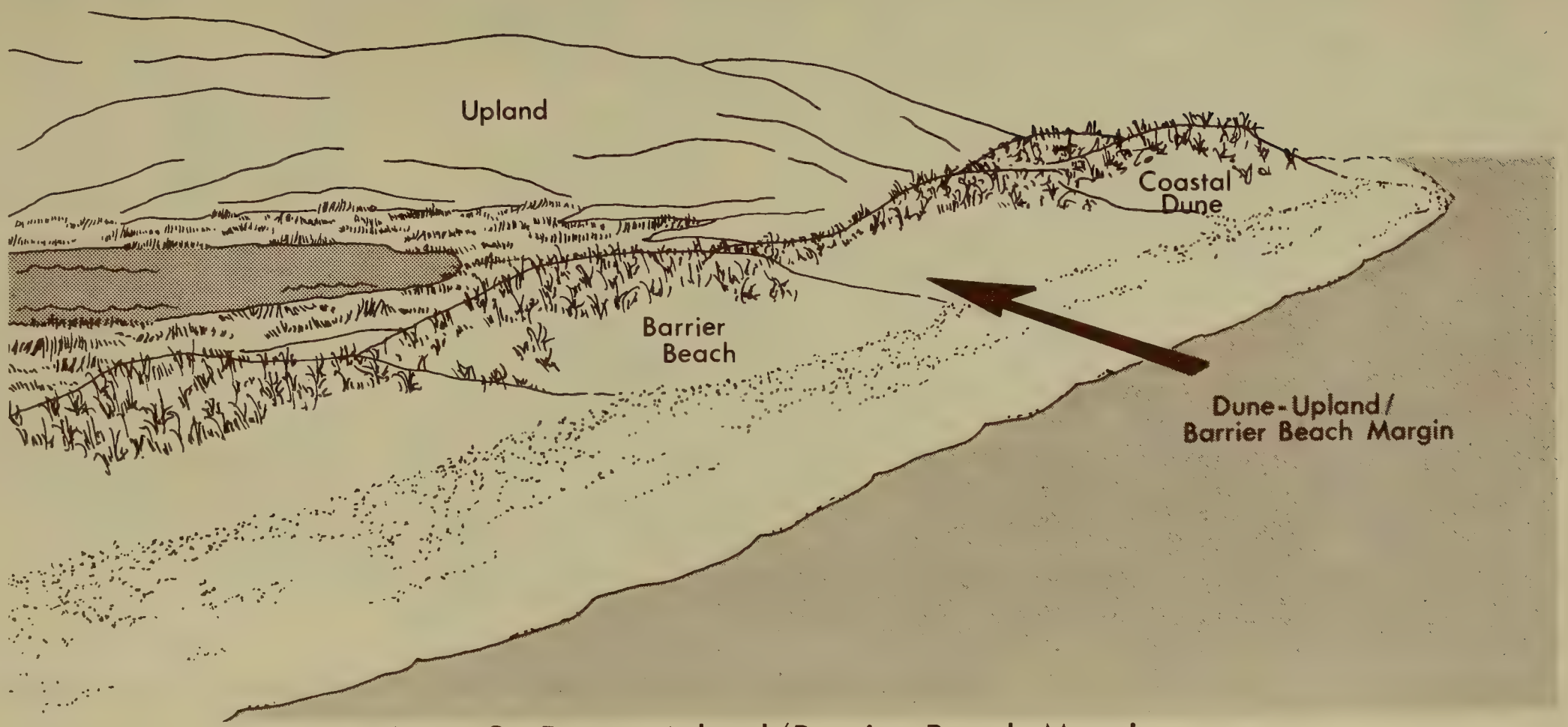


Figure 3. Dune-Upland/Barrier Beach Margin

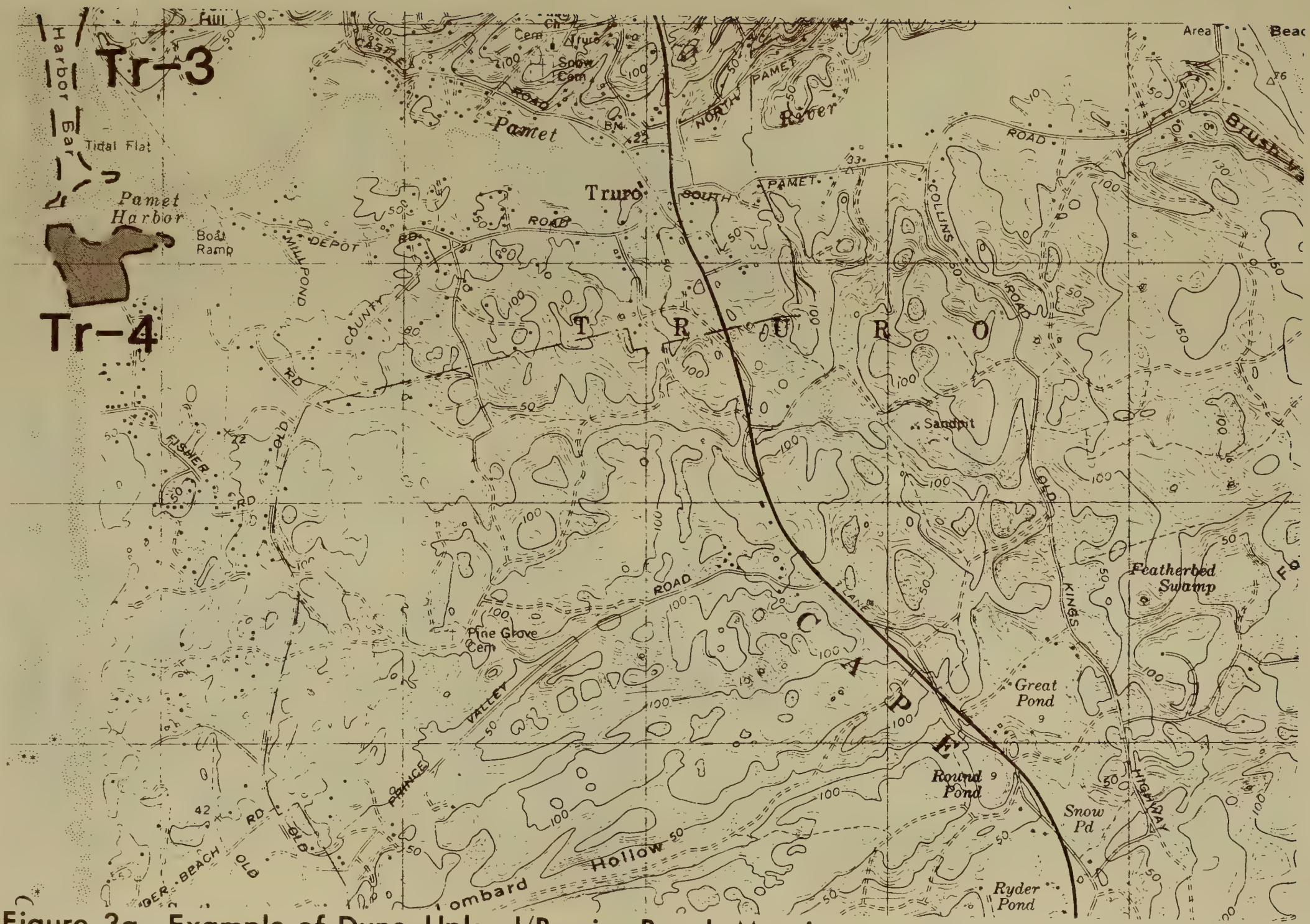


Figure 3a. Example of Dune-Upland/Barrier Beach Margin

Wellfleet Quad.

Figure 3b. Example of Dune-Upland/Barrier Beach Margin

Duxbury Quad.

(3) bedrock margin

The lateral margin of a barrier beach can terminate at bedrock, which is massive rock material formed by metamorphic, igneous or sedimentary processes. Bedrock can be found in several areas on the coast of Massachusetts (Figure 4). An example of bedrock/barrier beach margin is shown in Figure 4a.

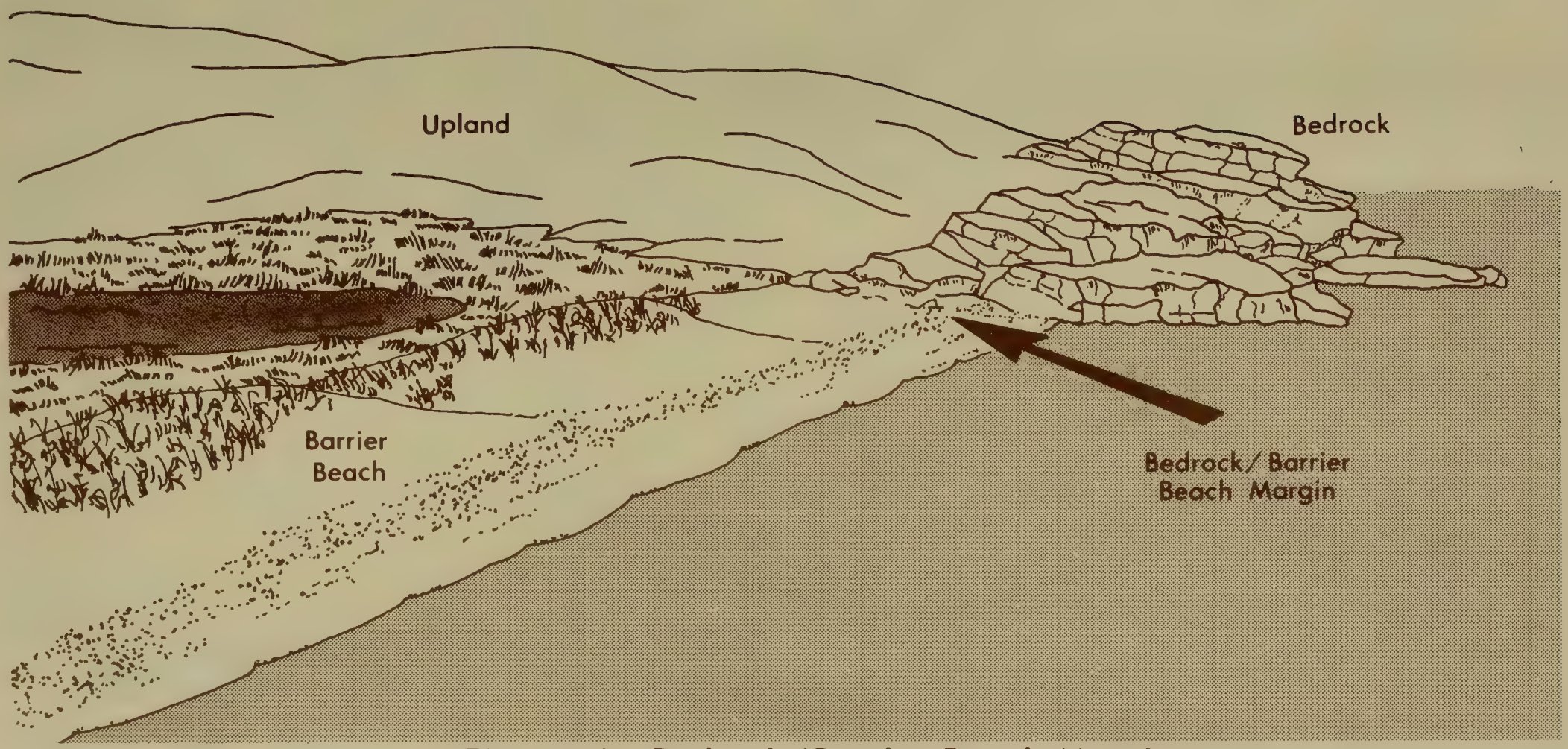


Figure 4. Bedrock/Barrier Beach Margin

Figure 4a. Example of Bedrock/Barrier Beach Margin

Marblehead N. Quad.

BARRIER BEACH MANAGEMENT UNITS

Since the first level of management of coastal wetlands in Massachusetts is with local government, the management unit selected for mapping purposes was at the town or municipal level. Some barrier beach landforms may be composed of more than one barrier beach management unit if the landform falls within the jurisdiction of more than one municipality.

IDENTIFICATION METHODOLOGY

MAP ANALYSIS

Using U.S. Geological Survey topographic quadrangle maps and National Ocean Survey nautical charts as well as the barrier beach characteristics described previously, a preliminary list of barrier beaches was developed. These maps were refined using all available historical accounts, scientific investigations and surficial geology publications, including surficial geology quadrangle maps published by the U.S. Geological Survey.

The Department of Environmental Management's Wetland Restriction Program (MGL c. 130 s. 105) orthophoto maps were available for all of Cape Cod, eastern Buzzards Bay, the South Shore, (Cohasset to Plymouth), Martha's Vineyard, and portions of the Parker River Estuary and Plum Island Sound on the North Shore. Barrier beach areas were delineated on some of these maps by the Wetland Restriction Program. However, the criteria they used in delineating barrier beach areas are for the purpose of placing deed restrictions on property. This different purpose requires, in most cases, a more limited area identified as barrier beach. Therefore, their delineations may be different from ours.

AERIAL RECONNAISSANCE FLIGHTS

Overflights were made of most coastal regions to further delineate the barrier beaches identified through the map analysis. For some coastal areas, especially more rural areas of Martha's Vineyard and Nantucket, no access was available on the ground. Therefore, the aerial flights represented the primary data source on these coastal areas. Low altitude oblique photographs were taken and analyzed to help determine barrier beach boundaries.

SITE VISITS

All accessible coastal areas were visited and studied on the site to identify and delineate the barrier beaches. Photographs, black and white prints and color 35mm slides were taken of each accessible barrier beach management unit. When possible, photographs were taken to show boundaries, alterations and resource characteristics Sediment properties (grain size, fabric and sedimentary structures) were analyzed on beaches and dune and bank faces to aid in distinguishing coastal banks (glacial deposits), artificial fill and beach and dune areas. The U.S. Geological Survey topographic quadrangle maps of the State (Appendix A-4) were used to present the final barrier beach delineations.

DATA SHEETS

A data sheet was compiled for each barrier beach management unit. The data sheet form is shown on page A-3. As much information as possible was recorded on the data sheet for each barrier beach management unit. For those barriers where access was not a problem, more information could be collected. For all barriers the following information was provided:

Barrier beach management unit identification code

This code assigns a two letter abbreviation for each coastal town with barrier beaches. The number that follows the town code is the specific identification number for each unit in a town.

Example: Tr-7. "Tr-7" is the town code for Truro and "7" is the specific barrier beach management unit number.

Geographic names

The name of a unit is usually derived from names provided on USGS topographic quadrangle maps. In some cases no geographic name on the topographic map sufficiently identified a particular barrier, and consequently nearby street names are used for identification.

Boundaries

The determination of where a barrier beach ends and where another coastal feature begins is an important component of a barrier beach delineation. Boundary determinations and delineations are based on the coastal wetlands regulations' definitions. The boundaries that define the location of a barrier beach include the two lateral margins.

Characteristics--Alterations

Information on alterations (house, buildings, roads etc.) was collected in the field and from USGS topographic quadrangle maps as well as Department of Environmental Management Restriction Orthophoto maps.

INVENTORY MODIFICATION

This inventory serves as a vital data baseline for the management of Massachusetts barrier beaches. Additional information on the geomorphology, processes and socio-economic data of all barrier beach management units will be collected, analyzed and continually updated.

This first edition of the inventory maps represents the most complete and accurate inventory of barrier beaches that exists for Massachusetts. Unfortunately, detailed subsurface geological information is not available for each individual coastal barrier. It is possible that some landforms (or portions thereof) that have been identified as barriers should not have been. Conversely, there may be landforms that are barriers but were not so identified.

If it is believed that an area is not correctly identified, appropriate geologic or geomorphic data must be forwarded to the MCZM Office. These data should typically include:

a) subsurface borings

b) seismic records

c) historic photographs, charts or maps

The documentation must be accompanied by a detailed interpretation of the information by a qualified coastal geologist or geomorphologist, as well as an explanation of why changes are being requested. If these data clearly indicate that the delineations are incorrect, the maps will be revised.

APPENDICES

COMMONWEALTH OF MASSACHUSETTS

By His Excellency

EDWARD J. KING
Governor

EXECUTIVE ORDER NO. 181

BARRIER BEACHES

Preamble

A barrier beach is a narrow low-lying strip of land generally consisting of coastal beaches and coastal dunes extending roughly parallel to the trend of the coast. It is separated from the mainland by a narrow body of fresh brackish or saline water or marsh system. It is a fragile buffer that protects landward areas from coastal storm damage and flooding.

The strength of the barrier beach system lies in its dynamic character; its ability to respond to storms by changing to a more stable form. Frequently man induced changes to barrier beaches have decreased the ability of landform to provide storm damage prevention and flood control. Inappropriate development on barrier beaches has resulted in the loss of lives and great economic losses to residents and to local, state and federal governments. The taxpayer, who often cannot gain access to barrier beach areas, must subsidize disaster relief and flood insurance for these high hazard areas.

Since barrier beaches are presently migrating landward in response to rising sea level, future storm damage to development located on the barriers is inevitable.

WHEREAS, the Commonwealth seeks to mitigate future storm damage to its barrier beach areas;

NOW, THEREFORE, I, Edward J. King, Governor of the Commonwealth of Massachusetts, by virtue of the authority vested in me by the Constitution and laws of the Commonwealth, do hereby order and direct all relevant state agencies to adopt the following policies:

1. Barrier beaches shall be given priority status for self-help and other state and federal acquisition programs and this priority status shall be incorporated into the Statewide Outdoor Comprehensive Recreation Plan. The highest priority for disaster assistance funds shall go towards relocating willing sellers from storm damaged barrier beach areas.

2. State funds and federal grants for construction projects shall not be used to encourage growth and development in hazard prone barrier beach areas.

3. For state-owned barrier beach property, management plans shall be prepared which are consistent with state wetland policy and shall be submitted to the Secretary of Environmental Affairs for public review under the provisions of the Massachusetts Environmental Policy Act.

4. At a minimum, no development shall be permitted in the velocity zones or primary dune areas of barrier beaches identified by the Department of Environmental Quality Engineering.

5. Coastal engineering structures shall only be used on barrier beaches to maintain navigation channels at inlets and then only if mechanisms are employed to ensure that downdrift beaches are adequately supplied with sediment.

6. Dredge material of a compatible grain size shall be used for barrier beach nourishment, if economically feasible.

7. The Coastal Zone Management Office shall coordinate state agency management policy for barrier beach areas.

Given at the Executive Chamber in Boston this 8th day of August, in the year of Our Lord one thousand nine hundred and eighty and of the independence of America, two-hundred and five.

Edward J. King
EDWARD J. KING
GOVERNOR
Commonwealth of Massachusetts

Michael Joseph Connolly
Secretary of the Commonwealth

GOD SAVE THE COMMONWEALTH OF MASSACHUSETTS

Data Sheet Form

Town: Truro

Barrier Beach Management Unit: TR-7

Geographic Name: Ballston Beach

Boundaries

Exposed Side: Atlantic Ocean

Protected Side: Pamet River fresh water marsh

N side: Glacial upland/fresh water marsh margin at north side of parking lot

S side: Glacial upland/fresh water marsh margin at south side of parking lot

Characteristics - Alterations

Development (see fill section below)

Coastal Eng. Struct.: None

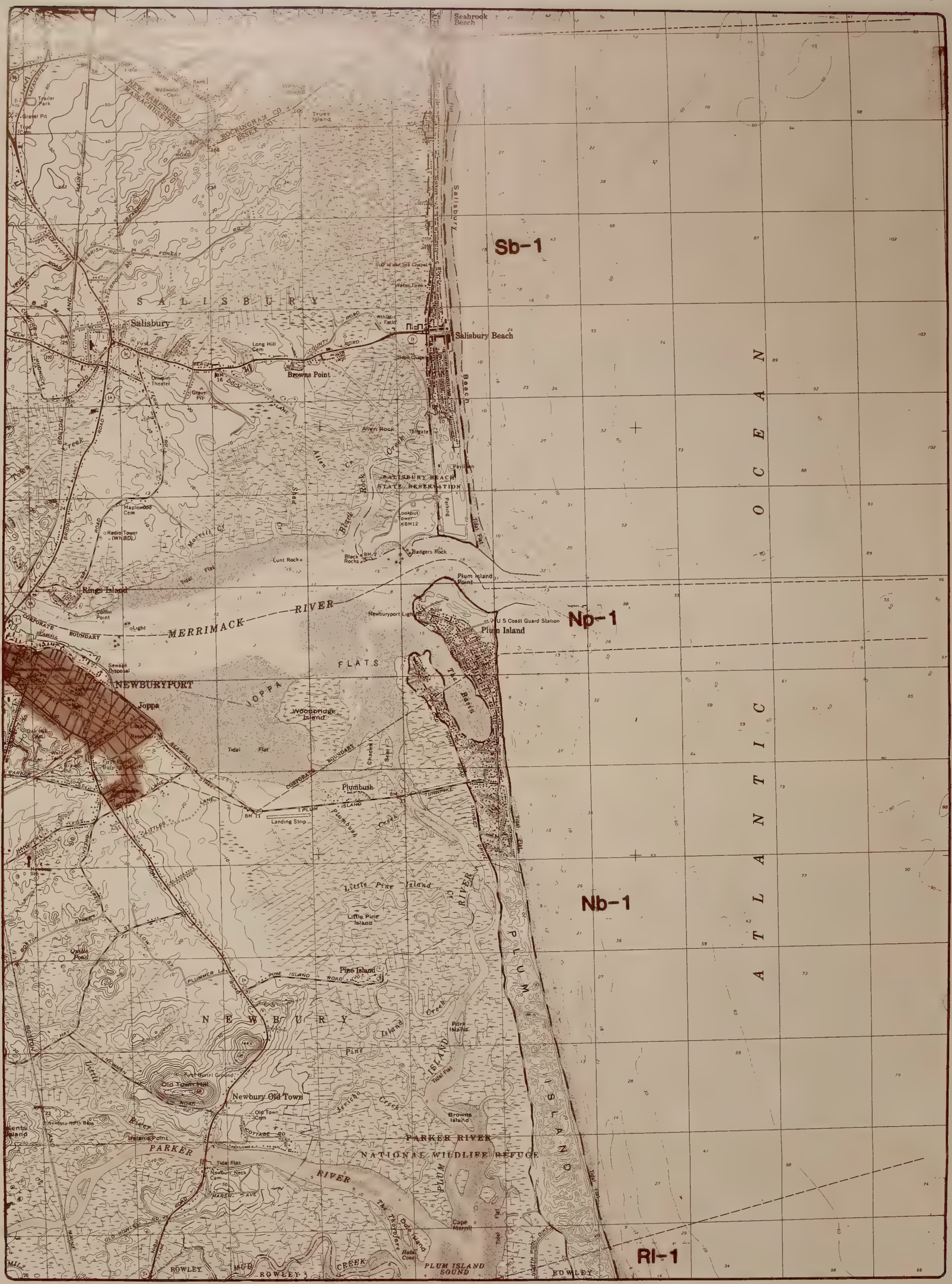
Fill: Abandoned parking lot at end of North and South Pamet Roads is being consumed by migrating barrier dunes.

Characteristics - Resource Areas

Coastal Beach: Sandy sediment

Coastal Dunes: Well developed dunes. Snow fences used to build dunes and control access.

Index Map
of U.S.G.S. Topographic Quadrangles
for the Barrier Beach Inventory Project



Barrier Beach Inventory Project

Executive Office of Environmental Affairs
Massachusetts Coastal Zone Management
Richard F. Delaney, Director

Project Coordinator: Gary Clayton
Geologic Advisor: Jeffrey Benoit

Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Nb-1
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass. Quadrangle Location

Newburyport East Quadrangle
Massachusetts - New Hampshire

The geological field research and mapping was compiled and produced under contract with **The Provincetown Center for Coastal Studies**

Principal Investigator: Lester B. Smith, Jr.
Date of completion: April 1982

Base maps are U.S. Geological Survey Quadrangles - 7.5 Minute Series (Topographic)
Department of Public Works, Massachusetts

The preparation of this publication was funded by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, under a program implementation grant to the Commonwealth of Massachusetts.

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Barrier Beach Unit Code System

Is - 5
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Ipswich Quadrangle
Massachusetts - Essex County

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Barrier Beach Unit Code System

Gt - 9
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Gloucester Quadrangle
Massachusetts - Essex County

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Barrier Beach Inventory Project

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Massachusetts Coastal Zone Management
Richard F. Delaney, Director

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Geologic Advisor: Jeffrey Benoit

Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Bv–1
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

Marblehead North Quadrangle
Massachusetts - Essex County

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Date of completion: April 1982

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Barrier Beach Inventory Project

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Massachusetts Coastal Zone Management
Richard F. Delaney, Director

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Barrier Beach Unit Code System

Bv–1
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.

Quadrangle Location

Marblehead North Quadrangle
Massachusetts - Essex County

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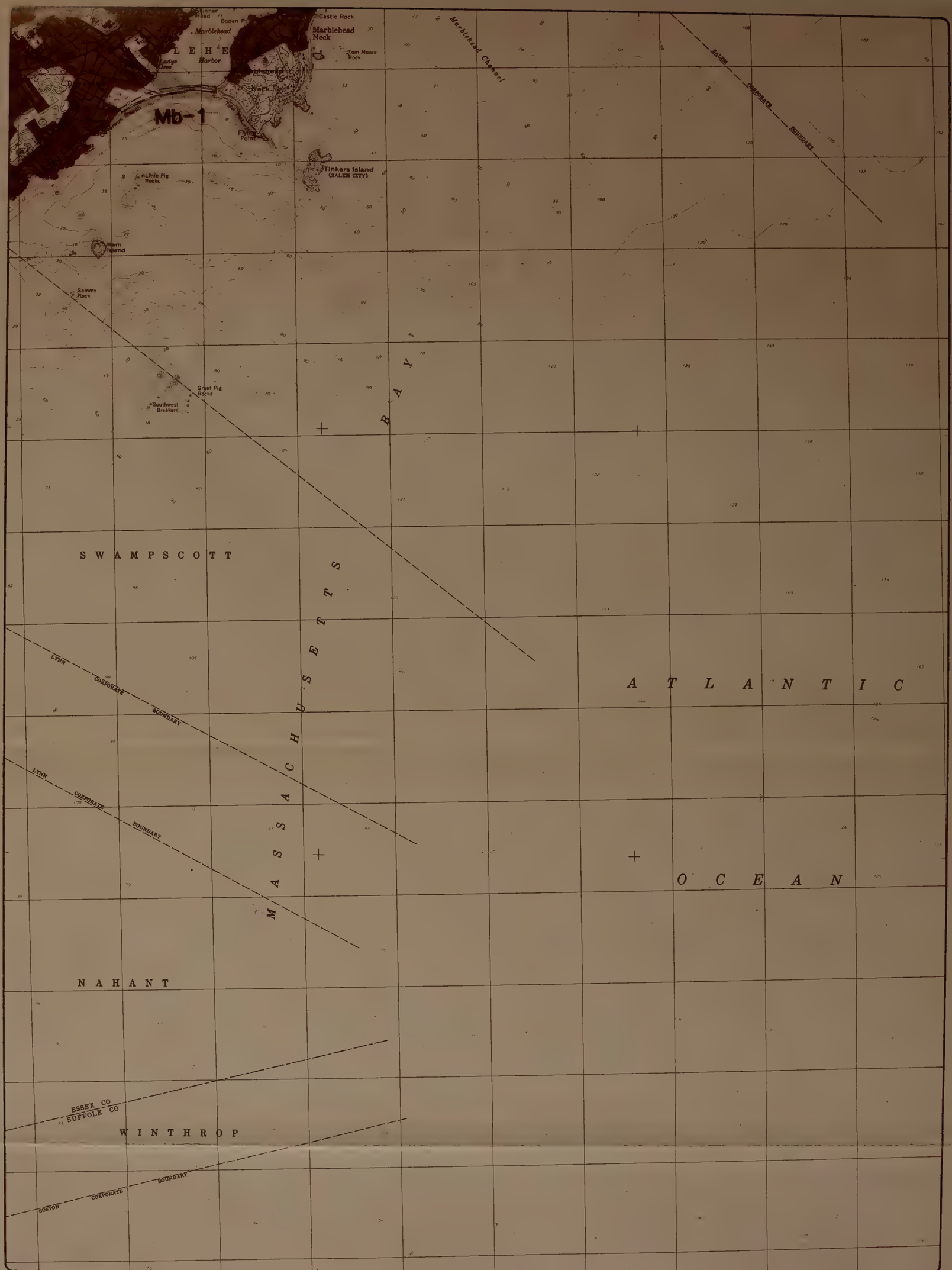

Barrier Beach Inventory Project

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Massachusetts Coastal Zone Management
Richard F. Delaney, Director

Project Coordinator: Gary Clayton
Geologic Advisor: Jeffrey Benoit

Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Mb–1
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Marblehead South Quandrangle
Massachusetts - Essex County

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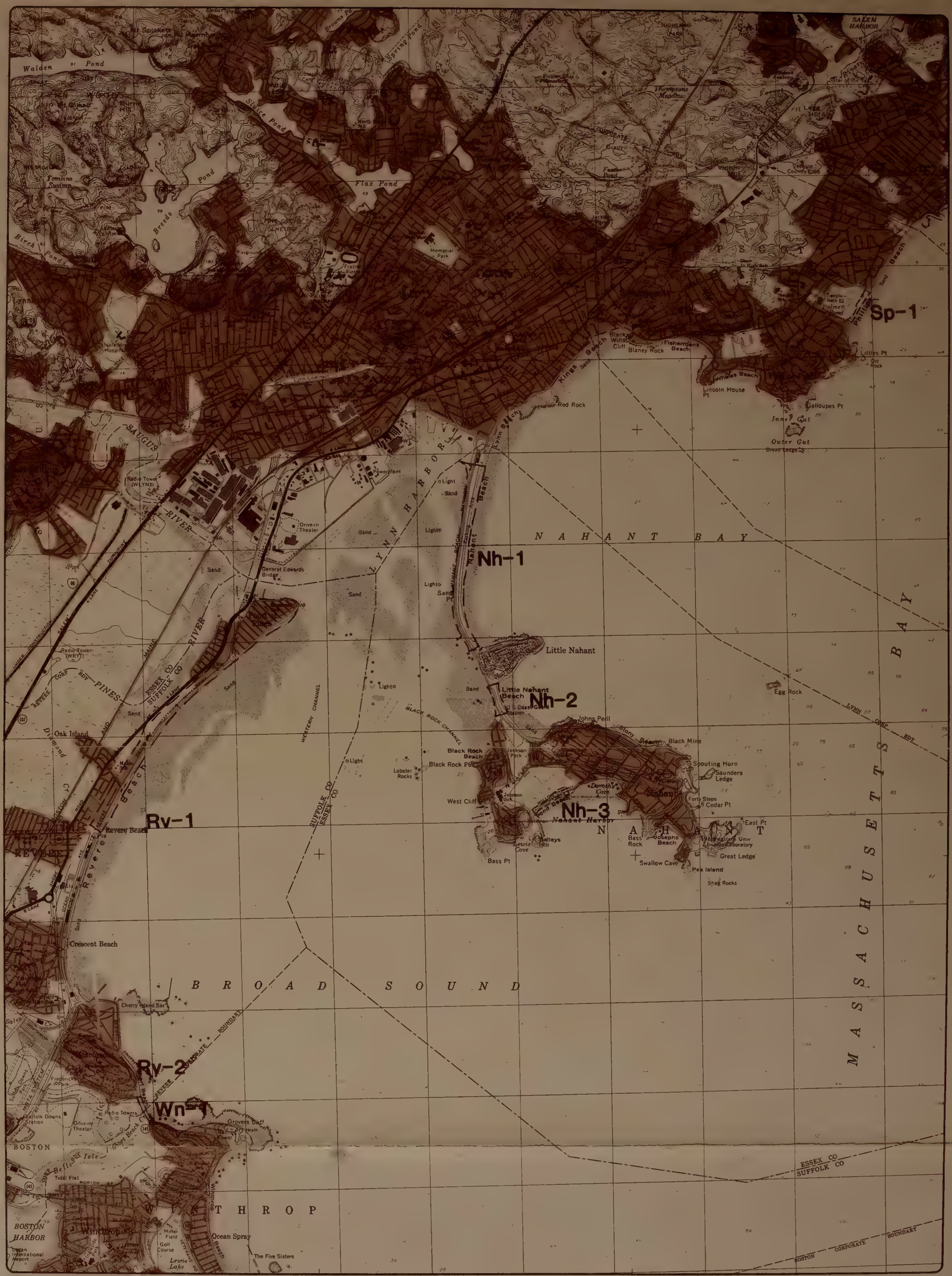

Barrier Beach Inventory Project

Executive Office of Environmental Affairs
Massachusetts Coastal Zone Management
Richard F. Delaney, Director

Project Coordinator: Gary Clayton
Geologic Advisor: Jeffrey Benoit

Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Nh – 3
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Lynn Quadrangle
Massachusetts - Essex County

The geological field research and mapping was compiled and produced under contract with **The Provincetown Center for Coastal Studies**

Principal Investigator: Lester B. Smith, Jr.
Date of completion: April 1982

Base maps are U.S. Geological Survey Quadrangles - 7.5 Minute Series (Topographic)
Department of Public Works, Massachusetts

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Barrier Beach Unit Code System

Bt–11
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

Boston South Quadrangle
Massachusetts - Suffolk County

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Massachusetts Coastal Zone Management
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Barrier Beach Unit Code System

Hl – 3
Town Barrier unit

Barrier Beach Margins

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- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

Hull Quadrangle
Massachusetts - Plymouth County

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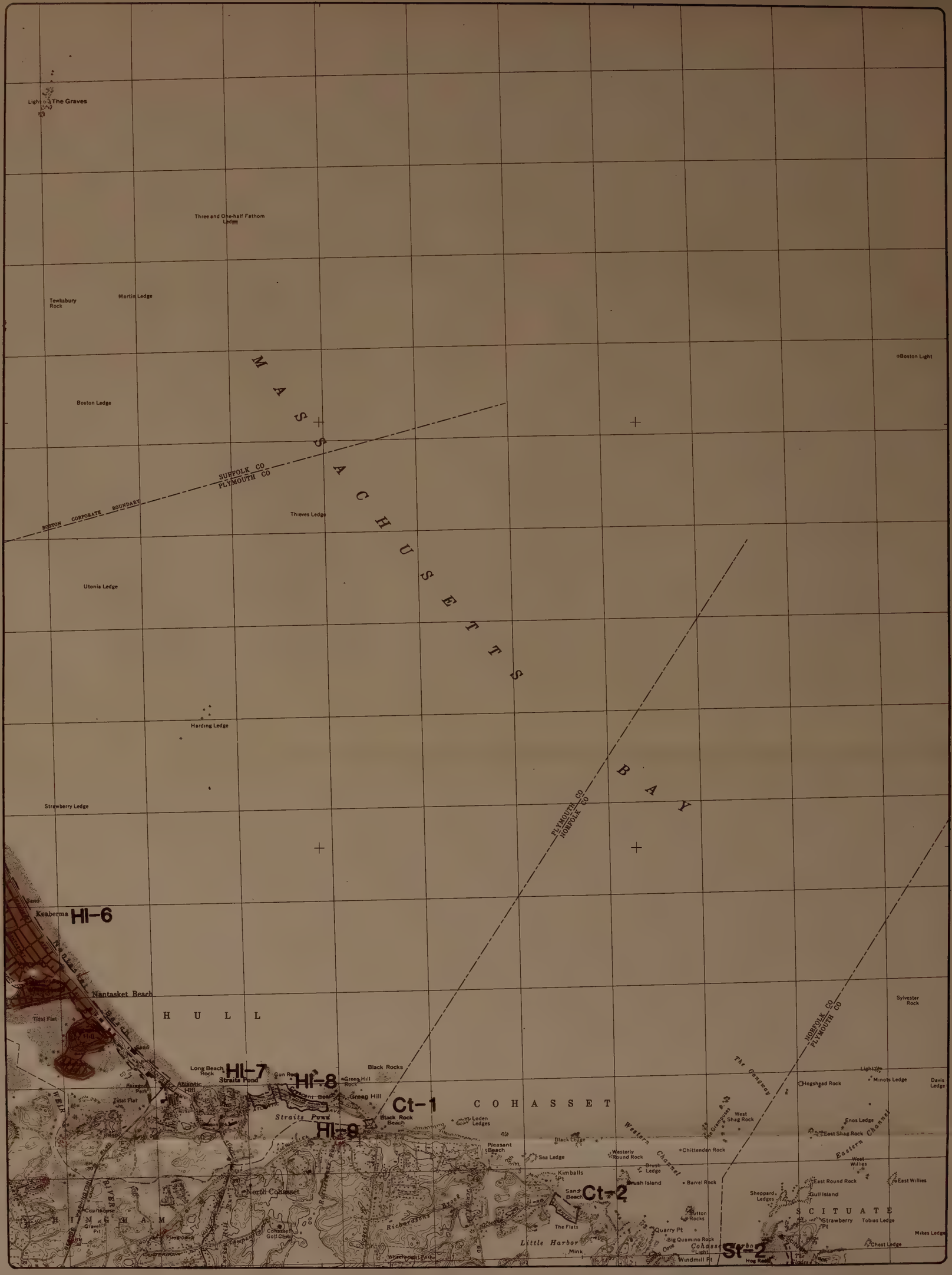

Barrier Beach Inventory Project

Executive Office of Environmental Affairs
Massachusetts Coastal Zone Management
Richard F. Delaney, Director

Project Coordinator: Gary Clayton
Geologic Advisor: Jeffrey Benoit

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Barrier Beach Unit Code System

Ct–2
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

Nantasket Beach Quadrangle
Massachusetts - Plymouth County

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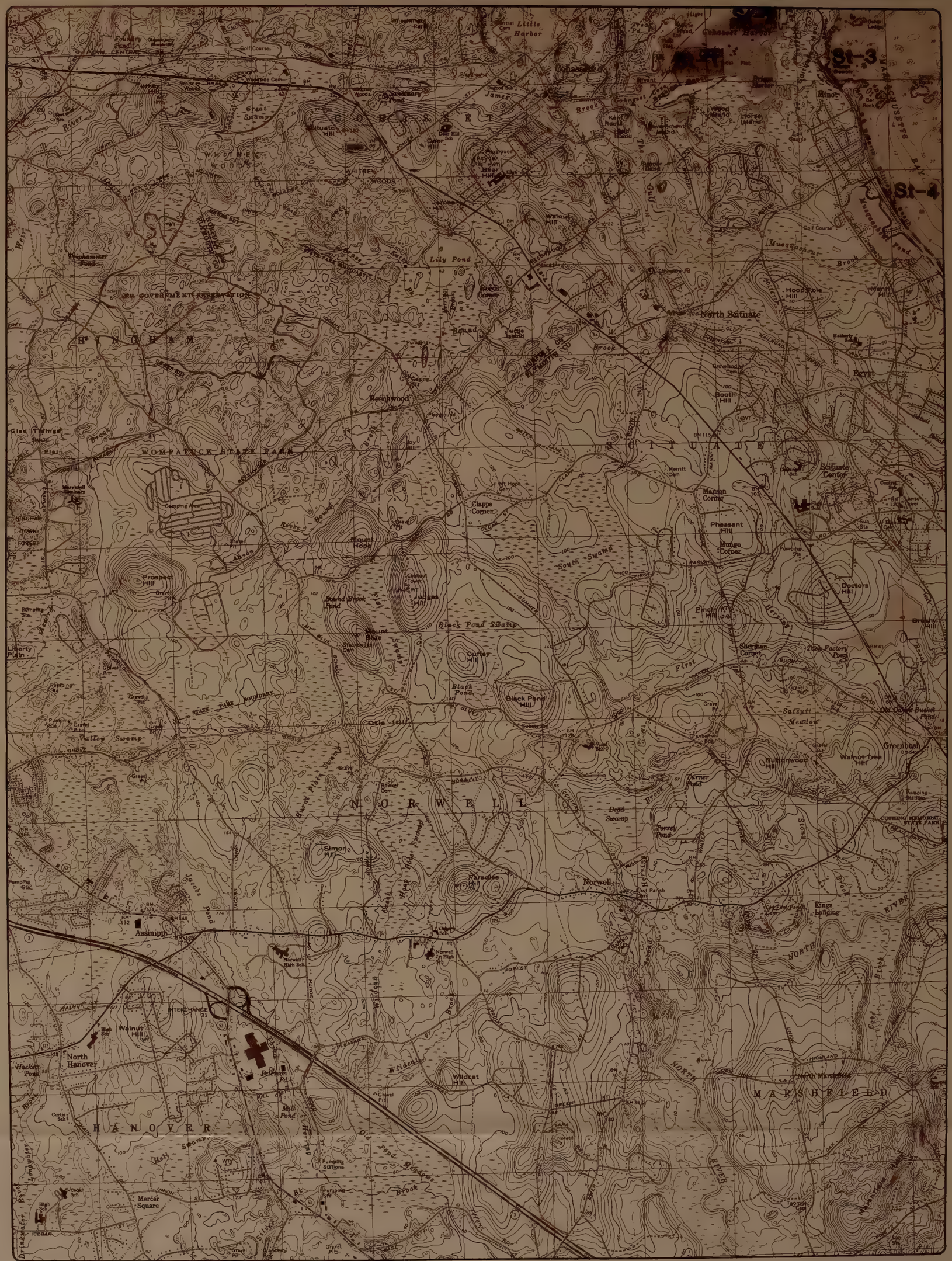

Barrier Beach Inventory Project

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Massachusetts Coastal Zone Management
Richard F. Delaney, Director

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Geologic Advisor: Jeffrey Benoit

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Barrier Beach Unit Code System

St – 4
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Cohasset Quadrangle
Massachusetts - Norfolk County

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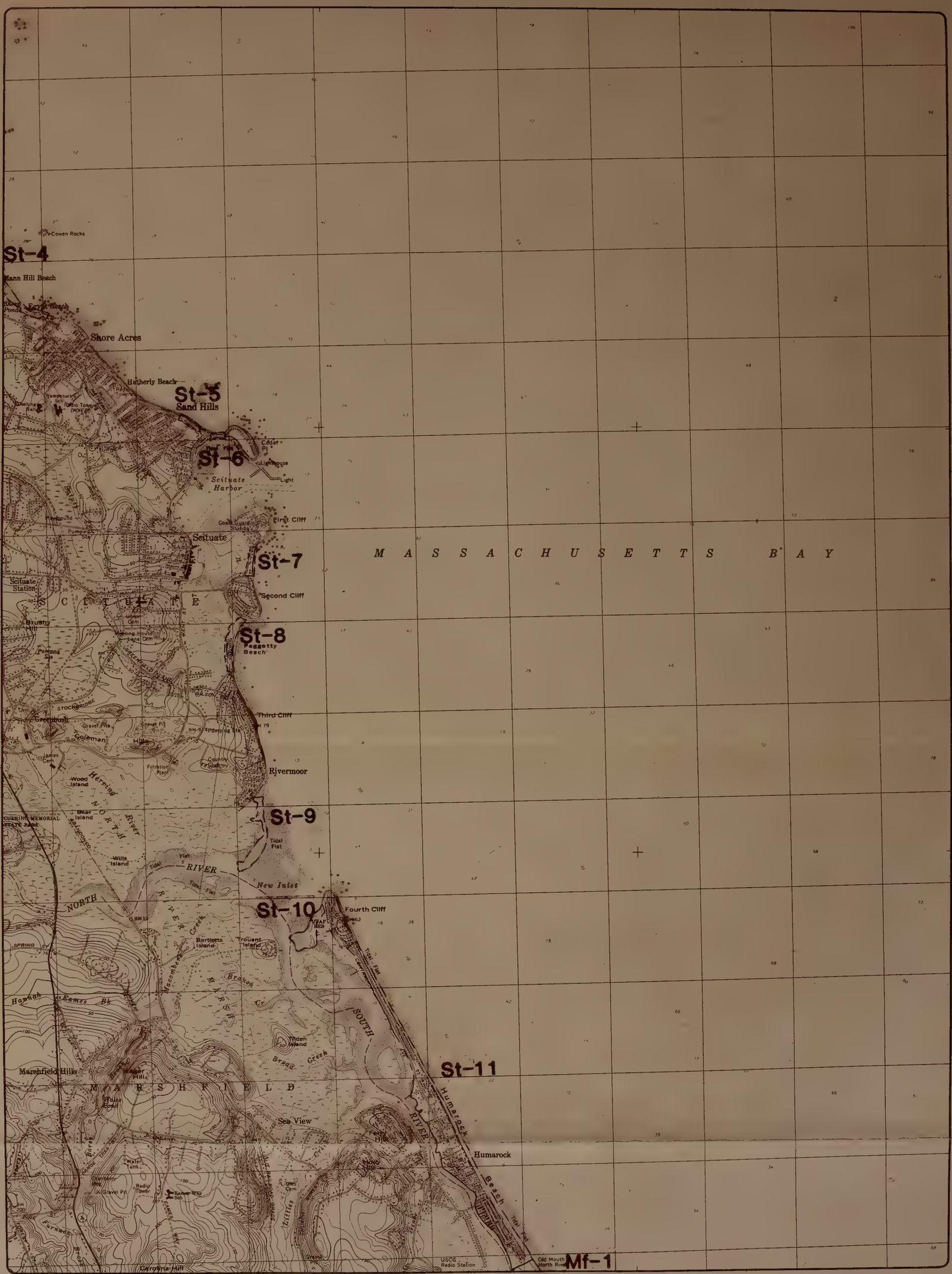

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Barrier Beach Unit Code System

St–10
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Scituate Quadrangle
Massachusetts - Plymouth County

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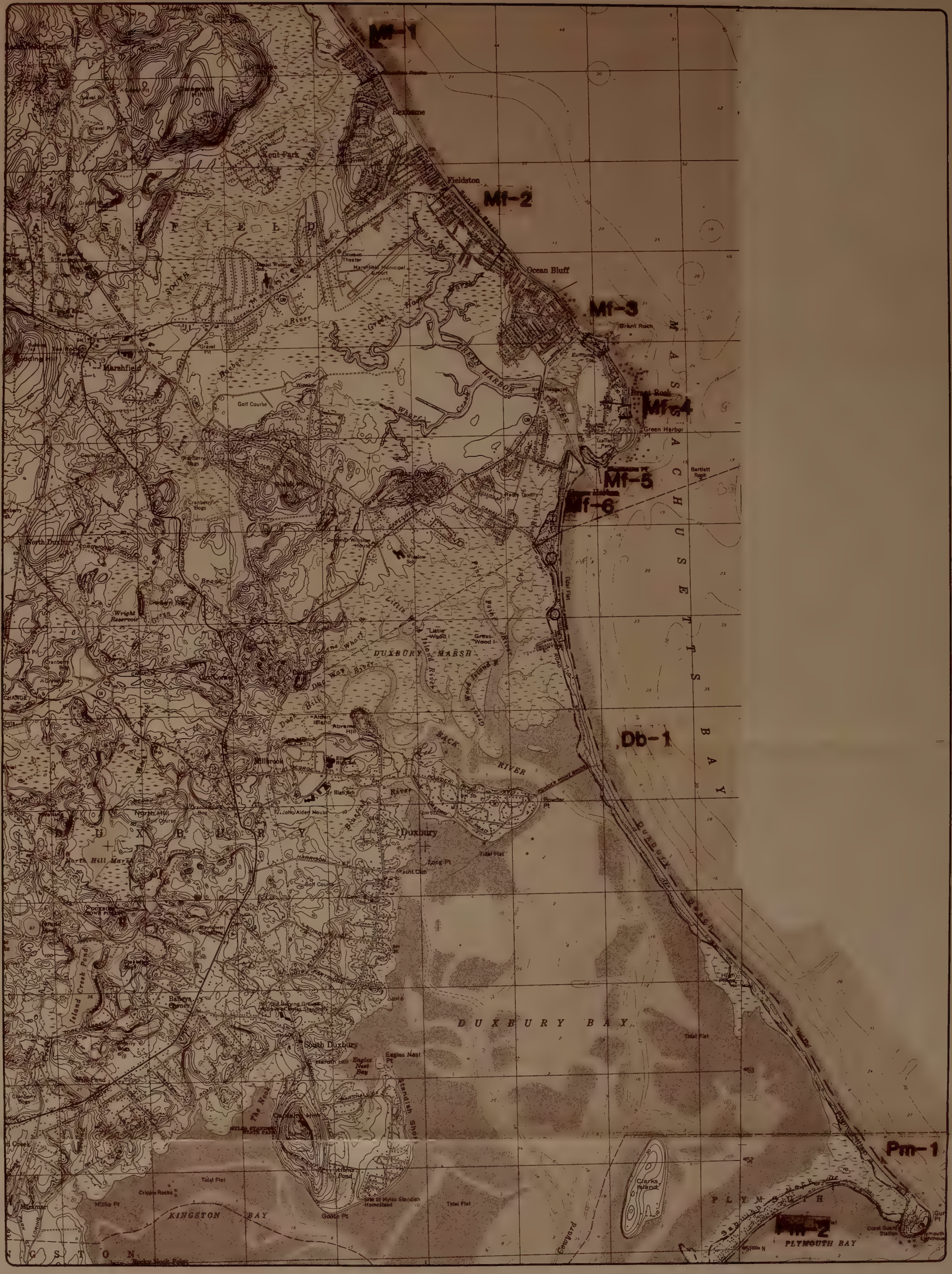

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Richard F. Delaney, Director

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Barrier Beach Unit Code System

Db–1
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.

Quadrangle Location

Duxbury Quadrangle
Massachusetts - Plymouth County

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Barrier Beach Unit Code System

Pm–8
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass
Quadrangle Location

Manomet Quadrangle
Massachusetts - Plymouth County

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Barrier Beach Unit Code System

Wh–1
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

Wareham Quadrangle
Massachusetts - Plymouth County

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Barrier Beach Unit Code System

Bo–29
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Sagamore Quadrangle
Massachusetts - Plymouth/Barnstable Counties

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Barrier Beach Unit Code System

Ss-2
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

Fall River Quadrangle
Massachusetts - Rhode Island

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Barrier Beach Unit Code System

Fh–15
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.

Quadrangle Location

New Bedford North Quadrangle
Massachusetts - Bristol County

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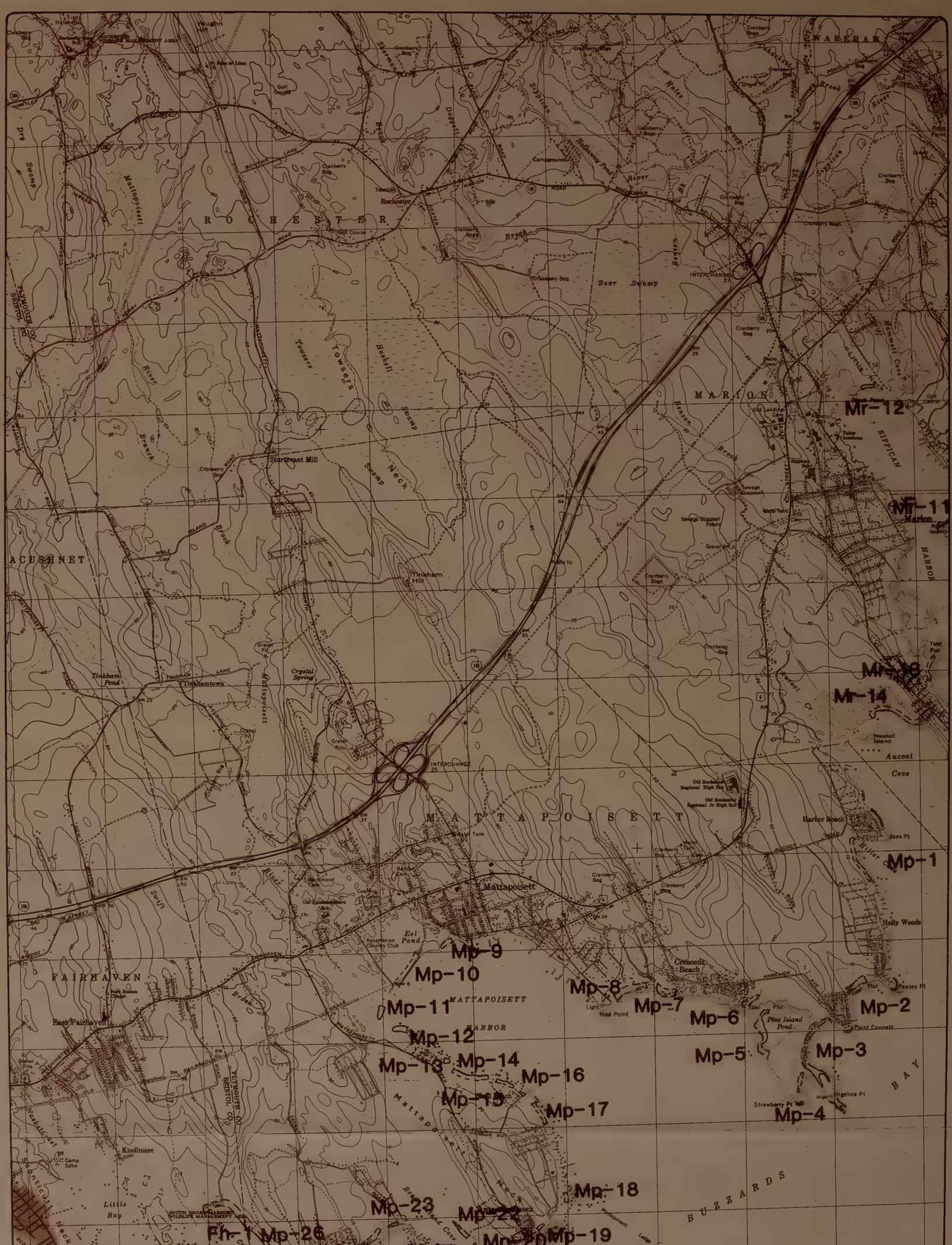

Barrier Beach Inventory Project

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Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Mp–18
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

Marion Quadrangle
Massachusetts - Plymouth County

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Barrier Beach Unit Code System

Mr–5
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

Mass

Quadrangle Location

Onset Quadrangle
Massachusetts - Plymouth/Barnstable Counties

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Barrier Beach Unit Code System

Wp–3
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

North

Westport Quadrangle
Massachusetts - Rhode Island

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Barrier Beach Unit Code System

Dm-6
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

New Bedford South Quadrangle
Massachusetts - Bristol County

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Barrier Beach Unit Code System

Fh – 23
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

Mass
Quadrangle Location

Sconticut Quadrangle
Massachusetts - Plymouth/Bristol Counties

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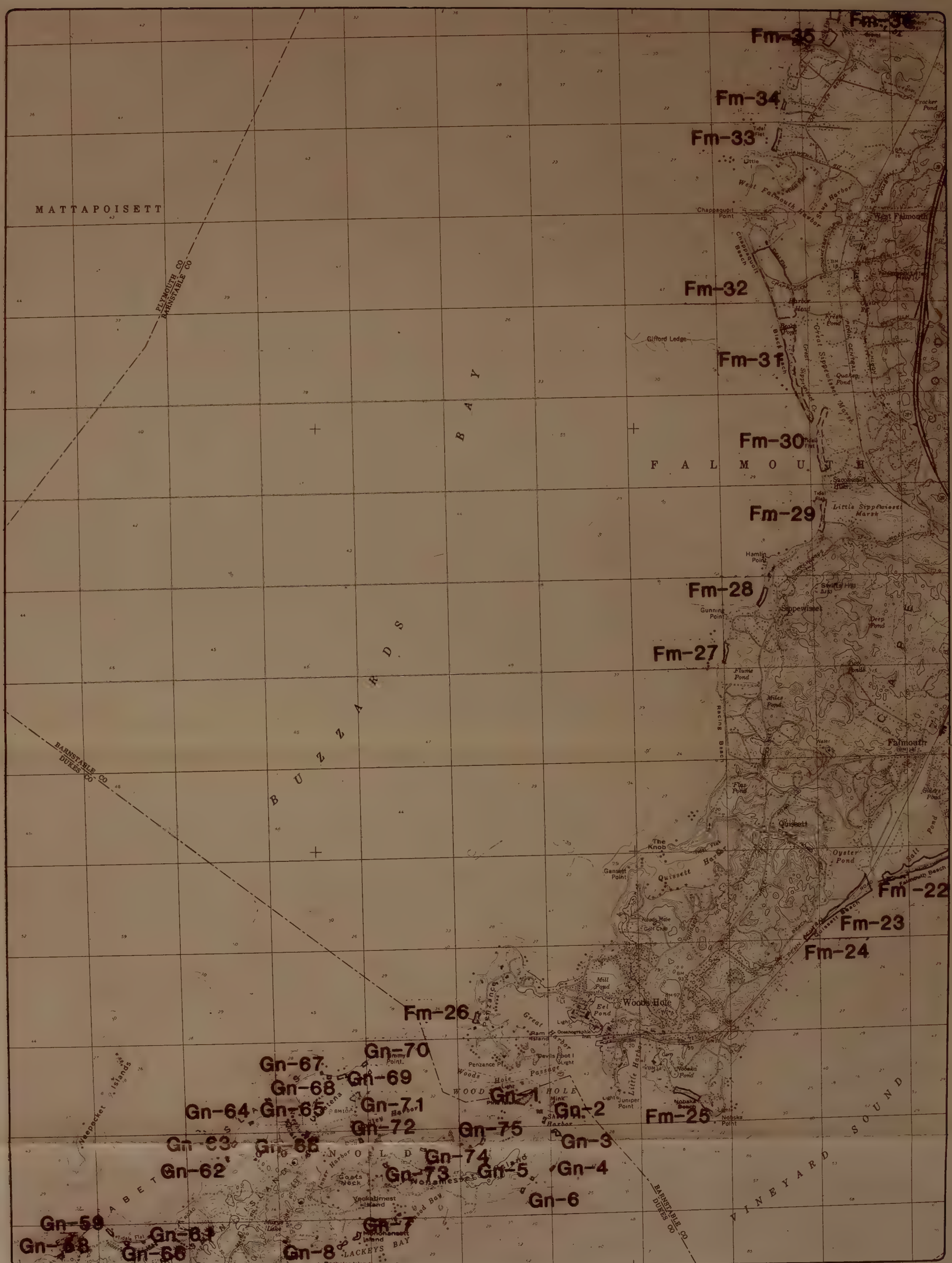

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Barrier Beach Unit Code System

Gn–67
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

~ no contiguous marsh and/or tidal flats are present

-.- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass. Quadrangle Location

Woods Hole Quadrangle
Massachusetts - Barnstable/Dukes Counties

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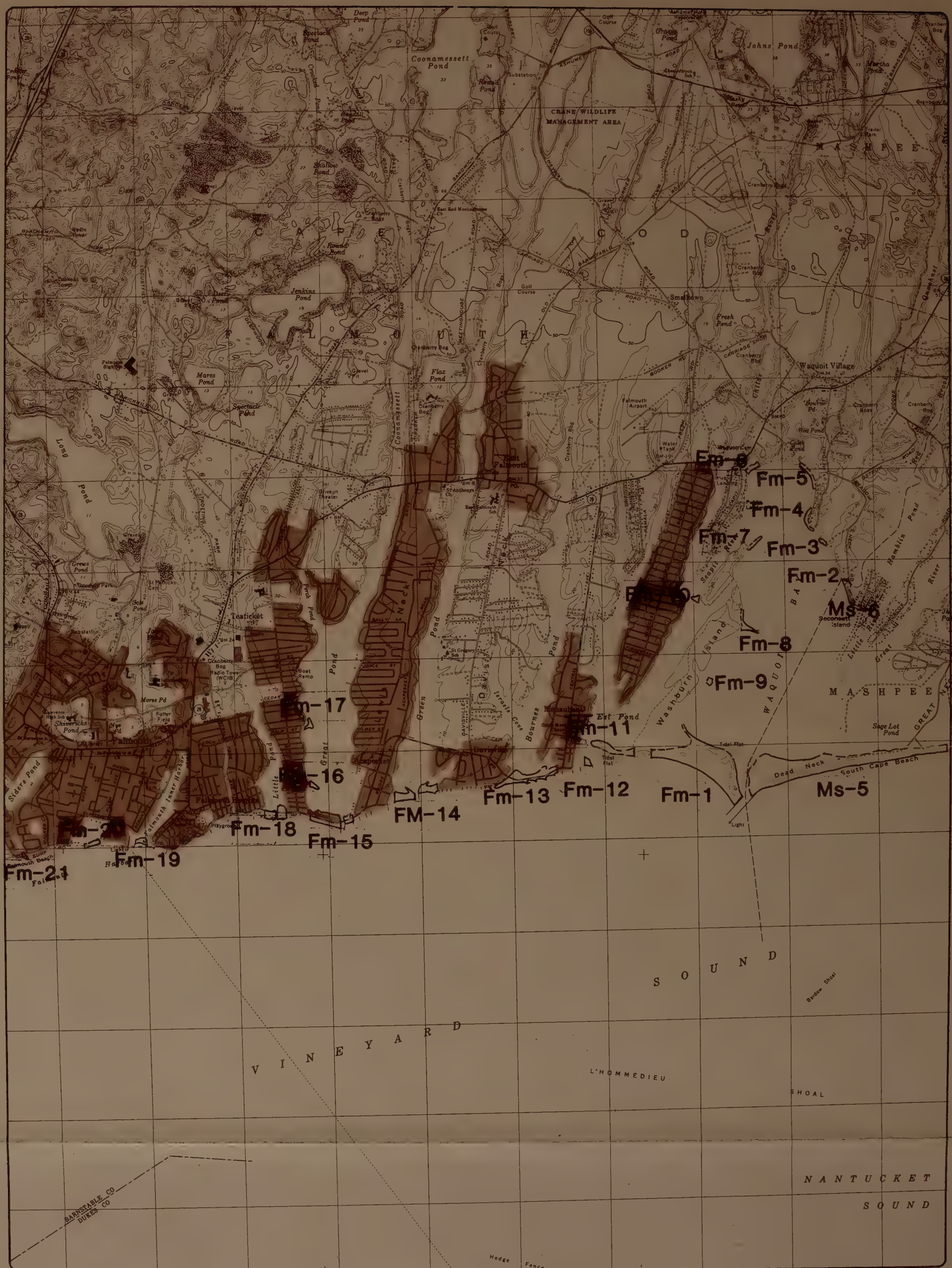

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Richard F. Delaney, Director

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Geologic Advisor: Jeffrey Benoit

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Barrier Beach Unit Code System

Fm–14
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Falmouth Quadrangle
Massachusetts - Banrstable County

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Barrier Beach Unit Code System

Bo–20
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Pocasset Quadrangle
Massachusetts - Barnstable County

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Barrier Beach Unit Code System

Sd-3
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass
Quadrangle Location

Sandwich Quadrangle
Massachusetts - Barnstable County

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Department of Public Works, Massachusetts

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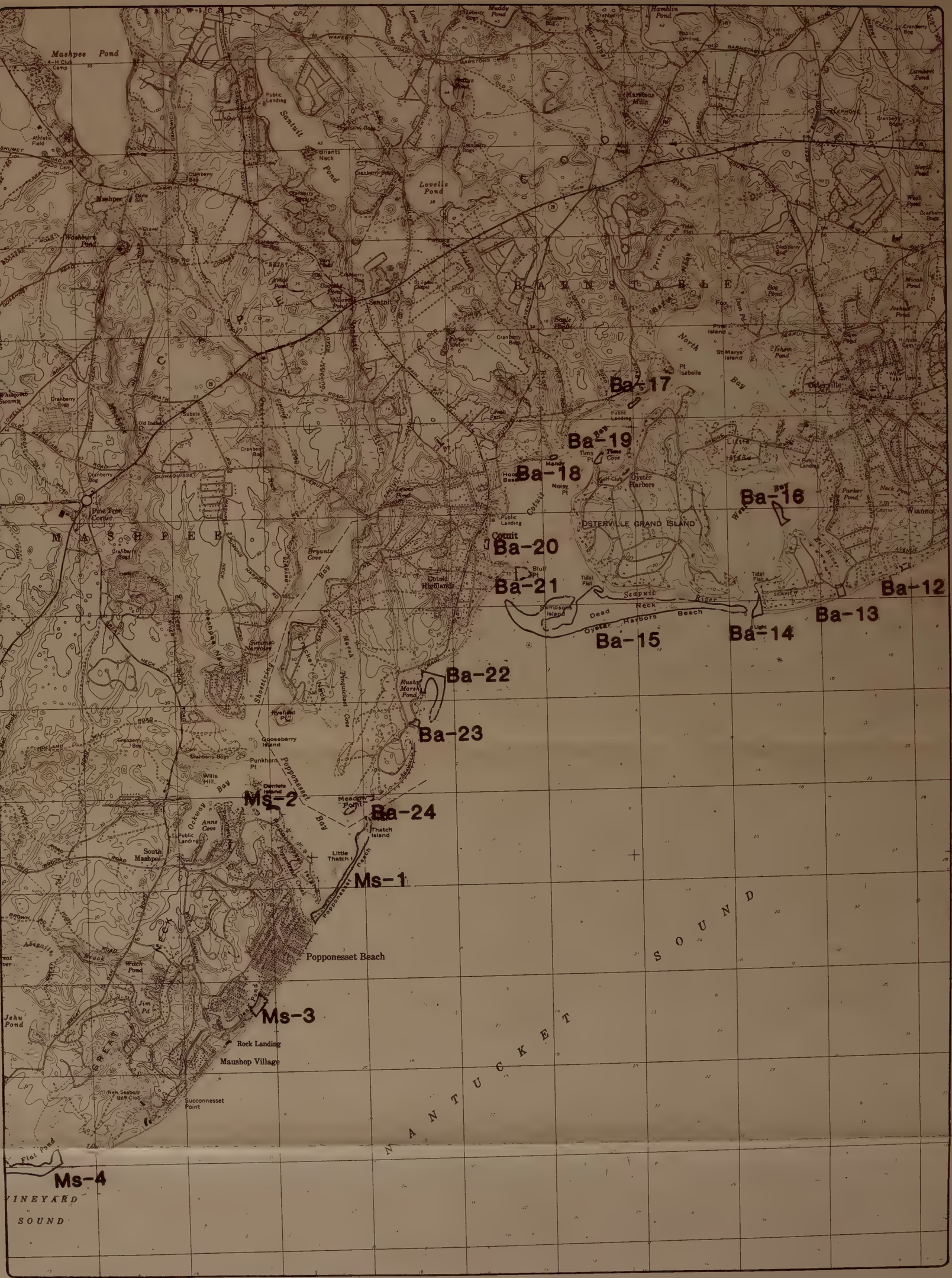

Barrier Beach Inventory Project

Executive Office of Environmental Affairs
Massachusetts Coastal Zone Management
Richard F. Delaney, Director

Project Coordinator: Gary Clayton
Geologic Advisor: Jeffrey Benoit

Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Ba–23
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Cotuit Quadrangle
Massachusetts - Barnstable County

The geological field research and mapping was compiled and produced under contract with **The Provincetown Center for Coastal Studies**

Principal Investigator: Lester B. Smith, Jr.
Date of completion: April 1982

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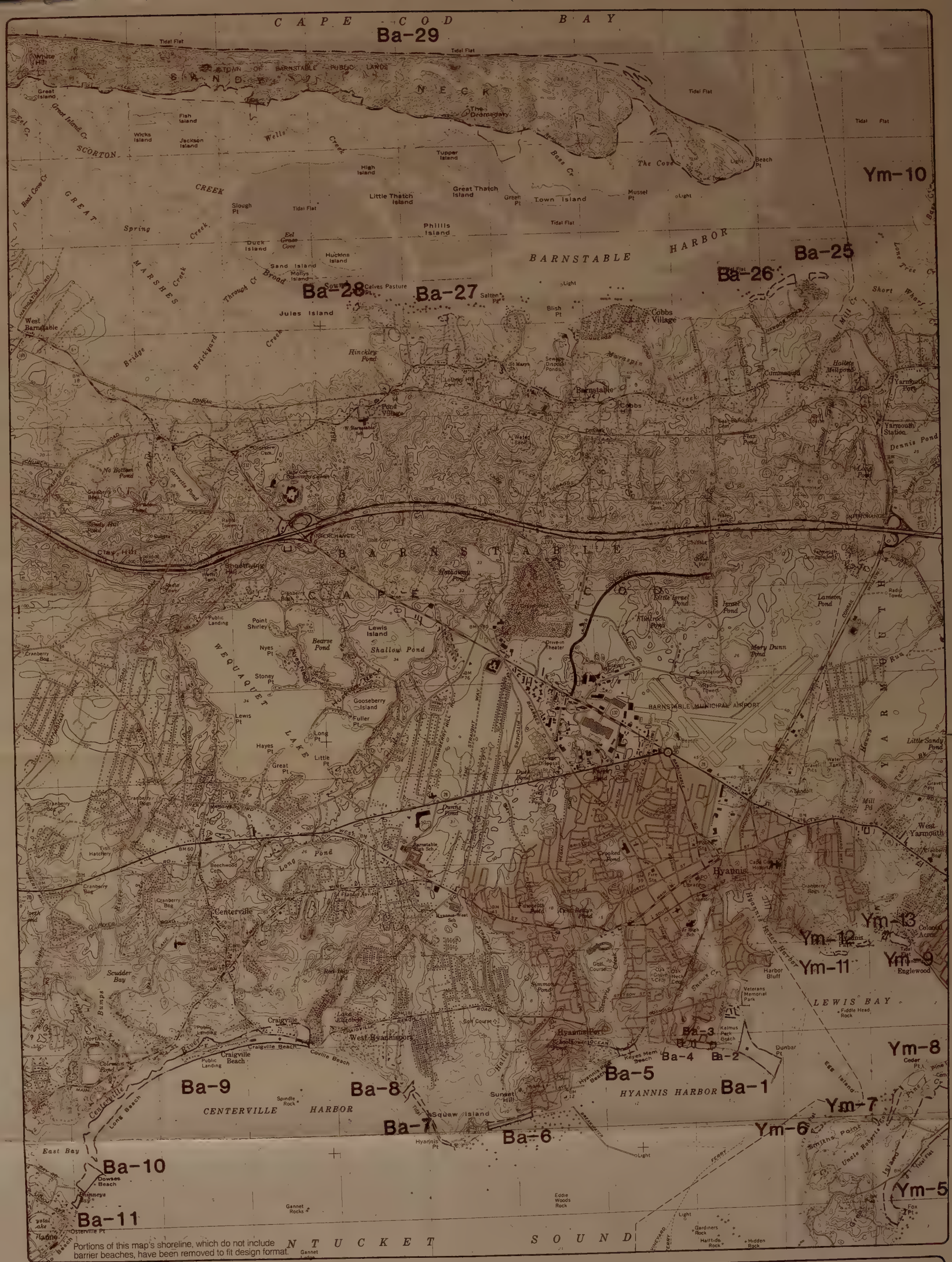

Portions of this map's shoreline, which do not include barrier beaches, have been removed to fit design format.

Barrier Beach Inventory Project

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Massachusetts Coastal Zone Management
Richard F. Delaney, Director

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Barrier Beach Unit Code System

Ba-7
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Hyannis Quadrangle
Massachusetts - Barnstable County

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Barrier Beach Unit Code System

Ym – 4
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Dennis Quadrangle (West)
Massachusetts - Barnstable County

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Barrier Beach Unit Code System

Dn–3
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Dennis Quadrangle (East)
Massachusetts - Barnstable County

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Barrier Beach Unit Code System

Hw-5
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Harwich Quadrangle
Massachusetts - Barnstable County

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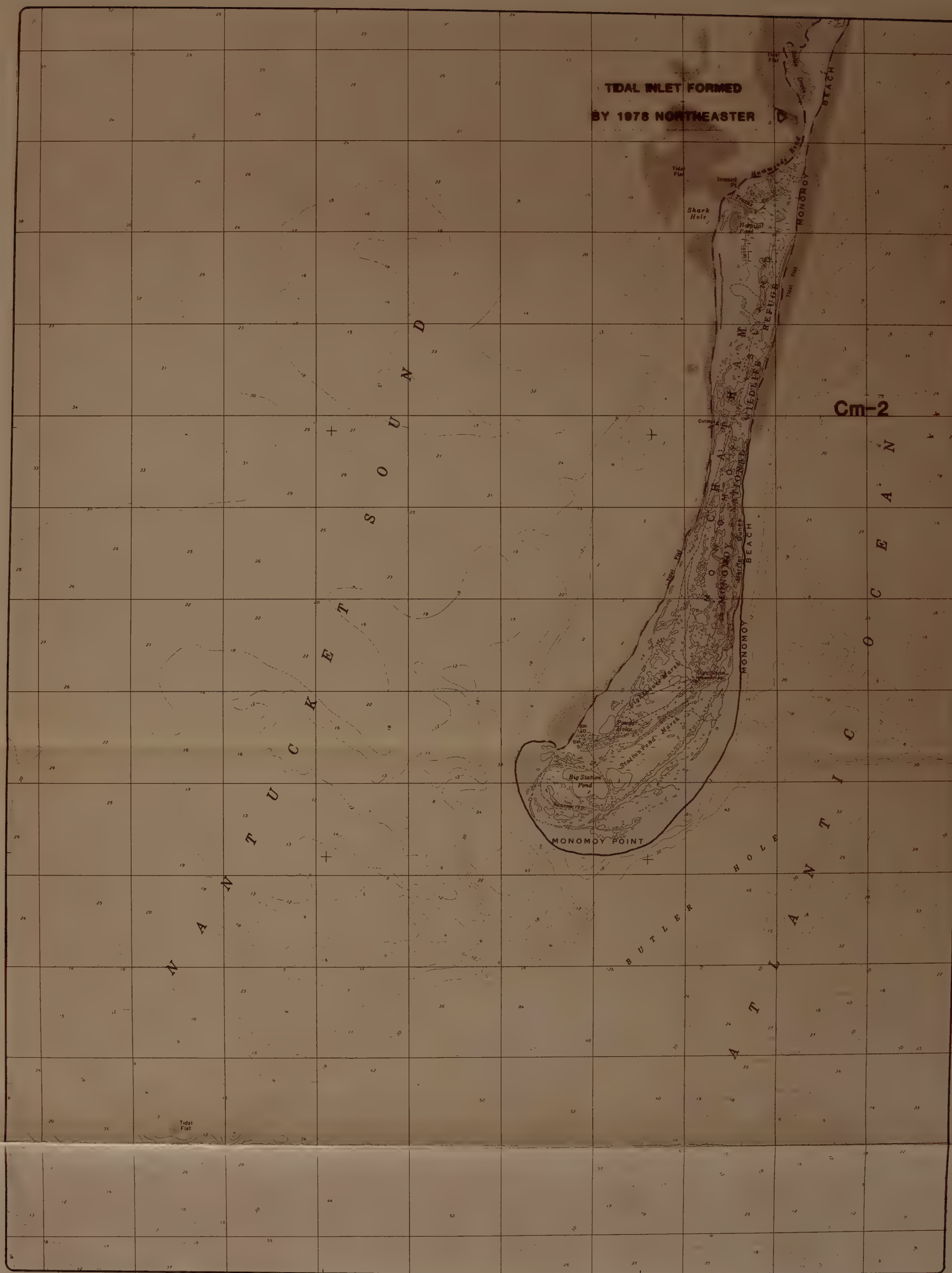

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Barrier Beach Unit Code System

Cm–2
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

~ no contiguous marsh and/or tidal flats are present

-.-.- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Monomoy Point Quadrangle
Massachusetts - Barnstable County

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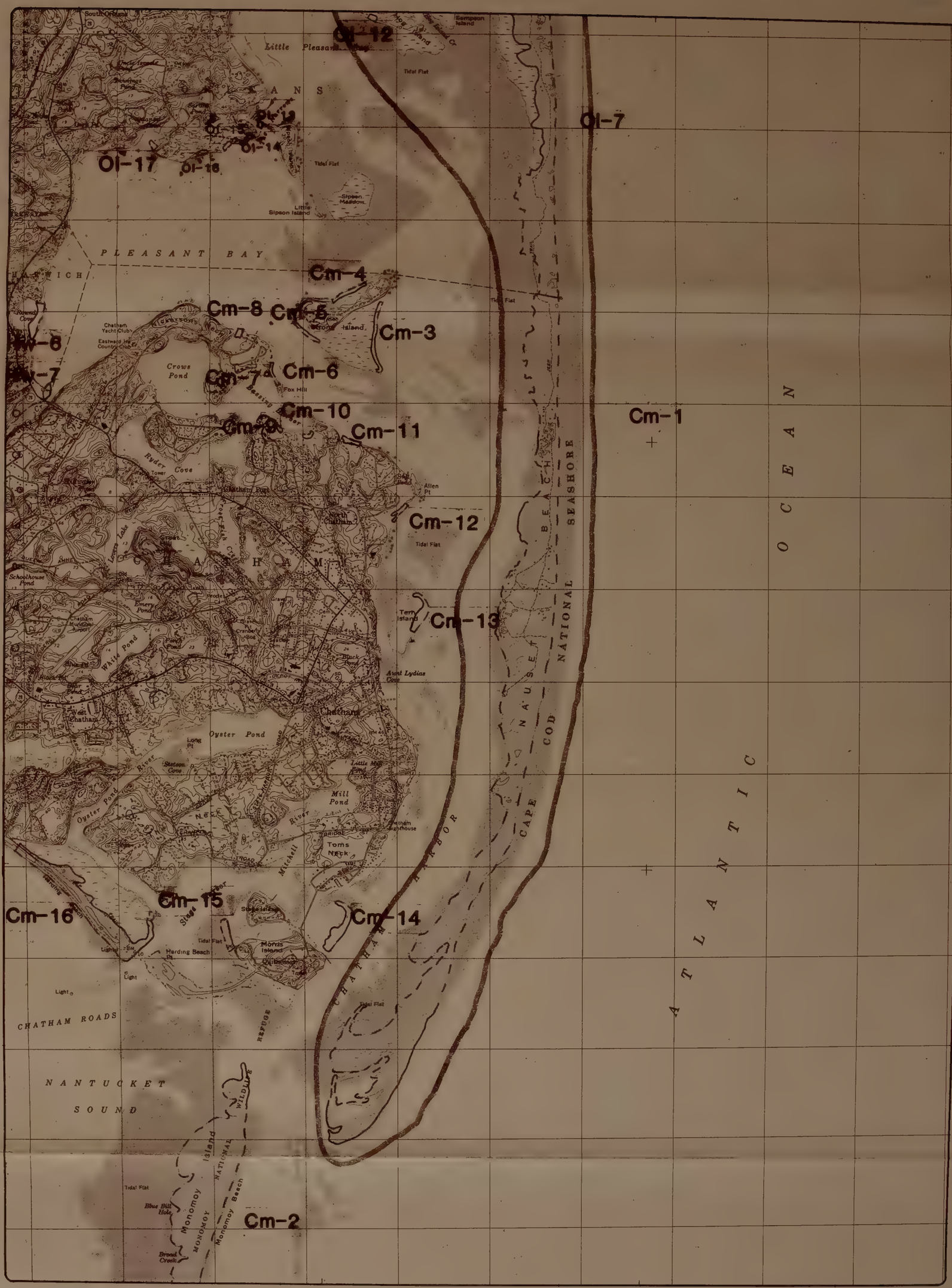

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Barrier Beach Unit Code System

Cm–15
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Chatham Quadrangle
Massachusetts - Barnstable county

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Barrier Beach Unit Code System

Ol – 9
Town — Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Orleans Quadrangle
Massachusetts - Barnstable County

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Barrier Beach Unit Code System

Wf–18
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Wellfleet Quadrangle
Massachusetts - Barnstable County

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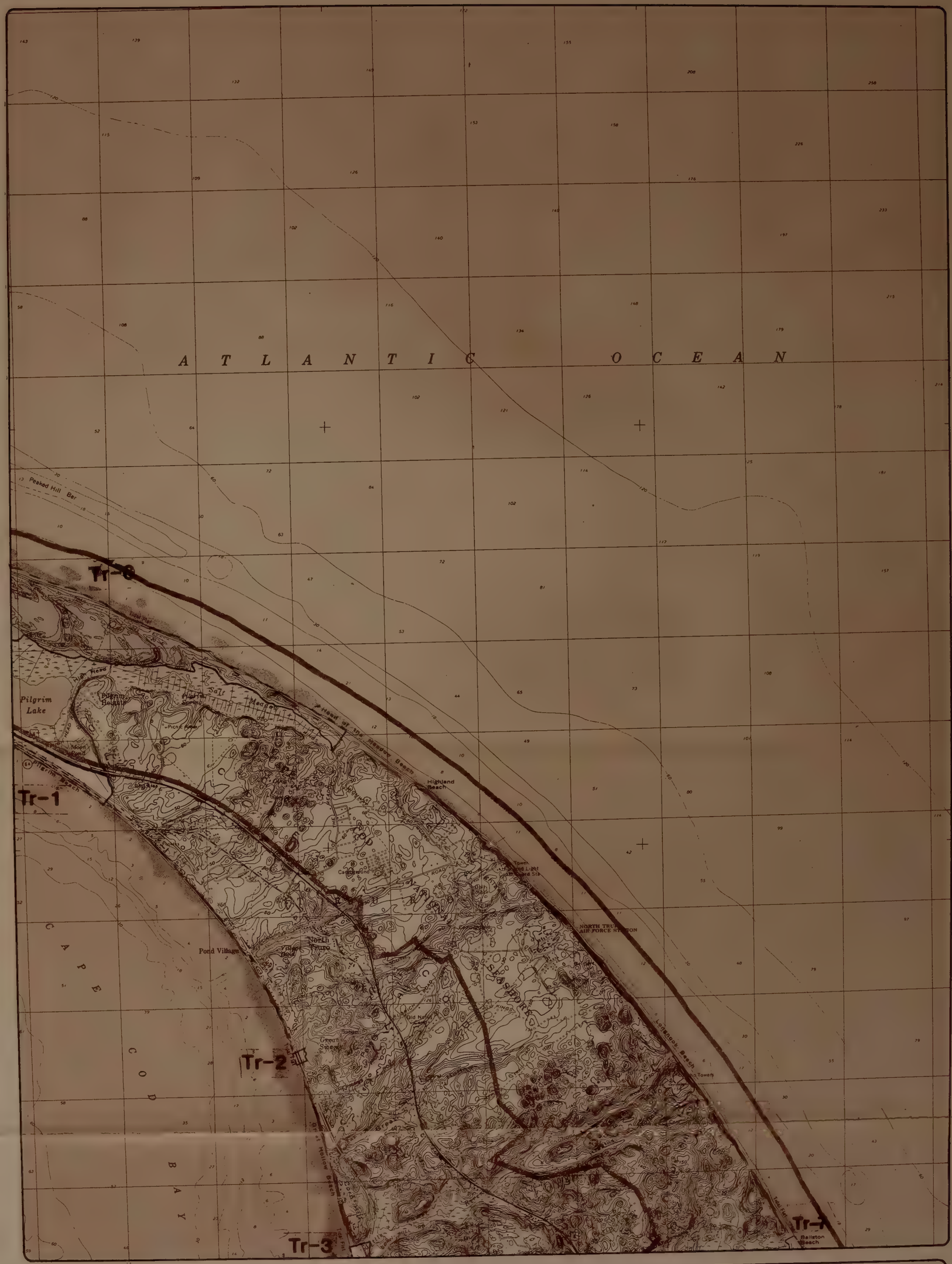

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Barrier Beach Unit Code System

Tr – 7
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

~~~ no contiguous marsh and/or tidal flats are present

~-~- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.

Quadrangle Location

North Truro Quadrangle
Massachusetts - Barnstable County

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Barrier Beach Unit Code System

Pt–1
Town Barrier unit

Barrier Beach Margins

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- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Provincetown Quadrangle
Massachusetts - Barnstable County

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Barrier Beach Unit Code System

Gn–33
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Cuttyhunk Quadrangle
Massachusetts - Dukes County

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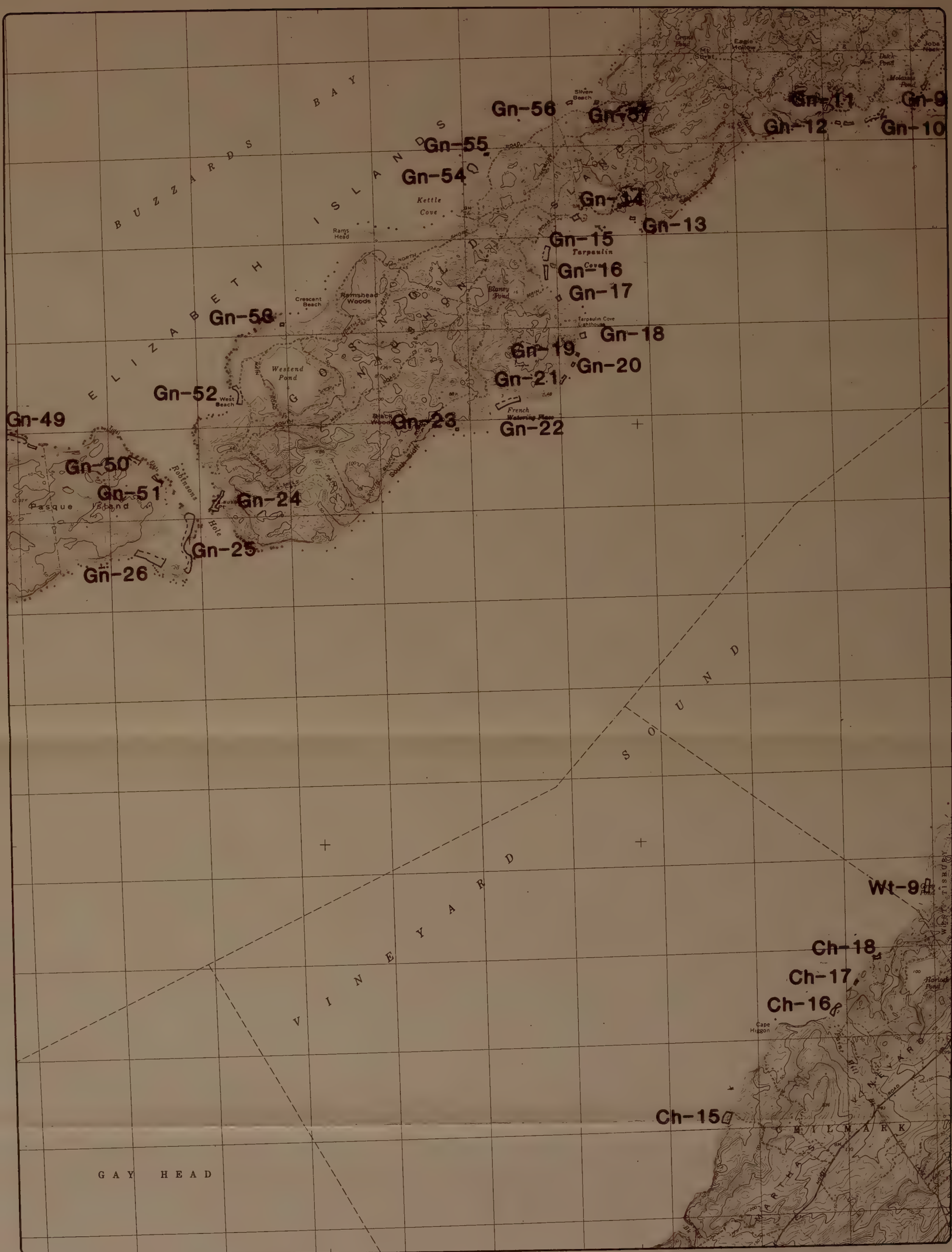

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Massachusetts Coastal Zone Management
Richard F. Delaney, Director

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Geologic Advisor: Jeffrey Benoit

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Barrier Beach Unit Code System

Ch–15
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass
Quadrangle Location

Naushon Island Quadrangle
Massachusetts - Dukes County

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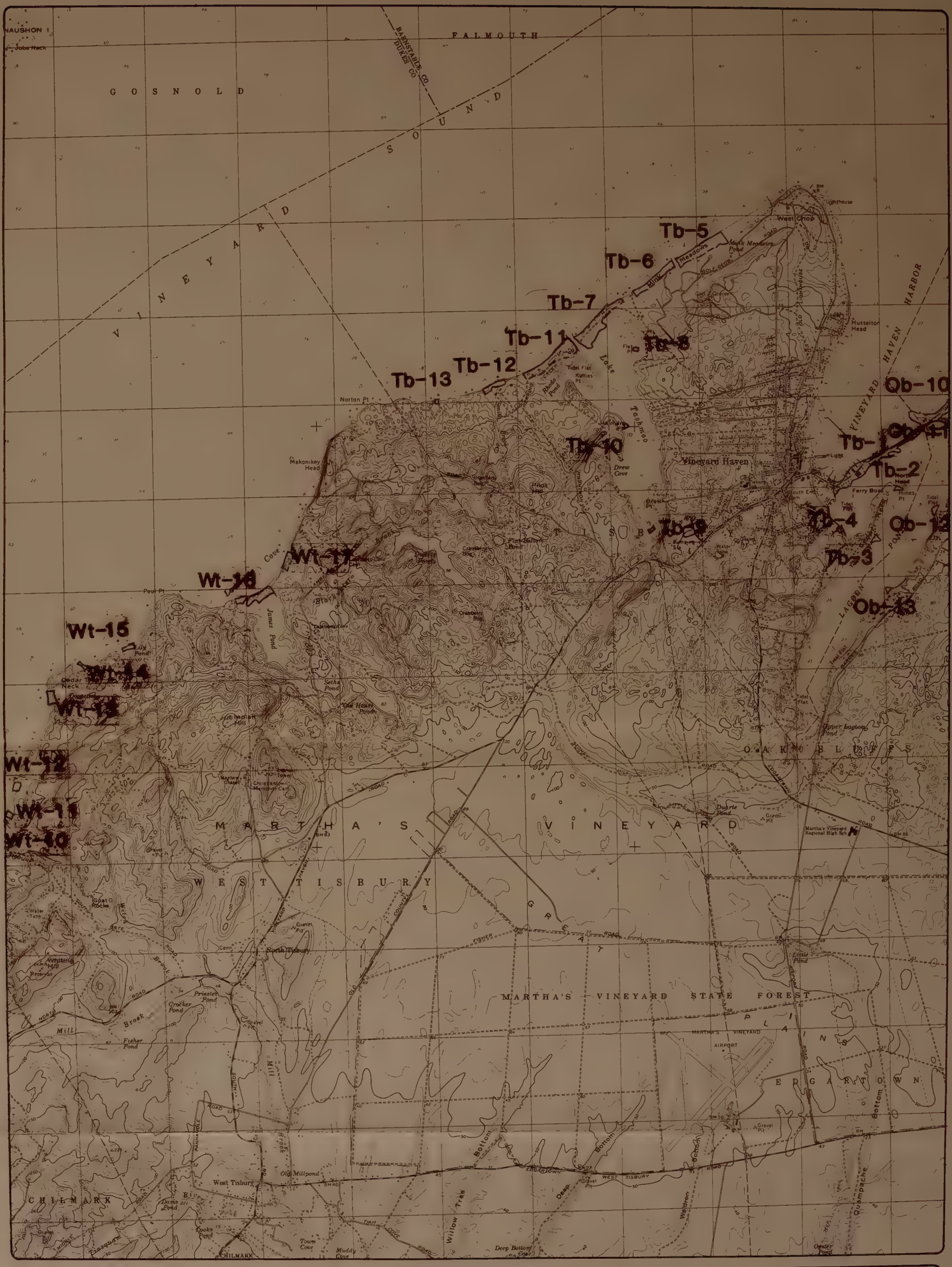

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Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Tb–9
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Vineyard Haven Quadrangle
Massachusetts - Dukes County

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Barrier Beach Unit Code System

Et–36
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.

Quadrangle Location

Edgartown Quadrangle (West)
Massachusetts - Dukes County

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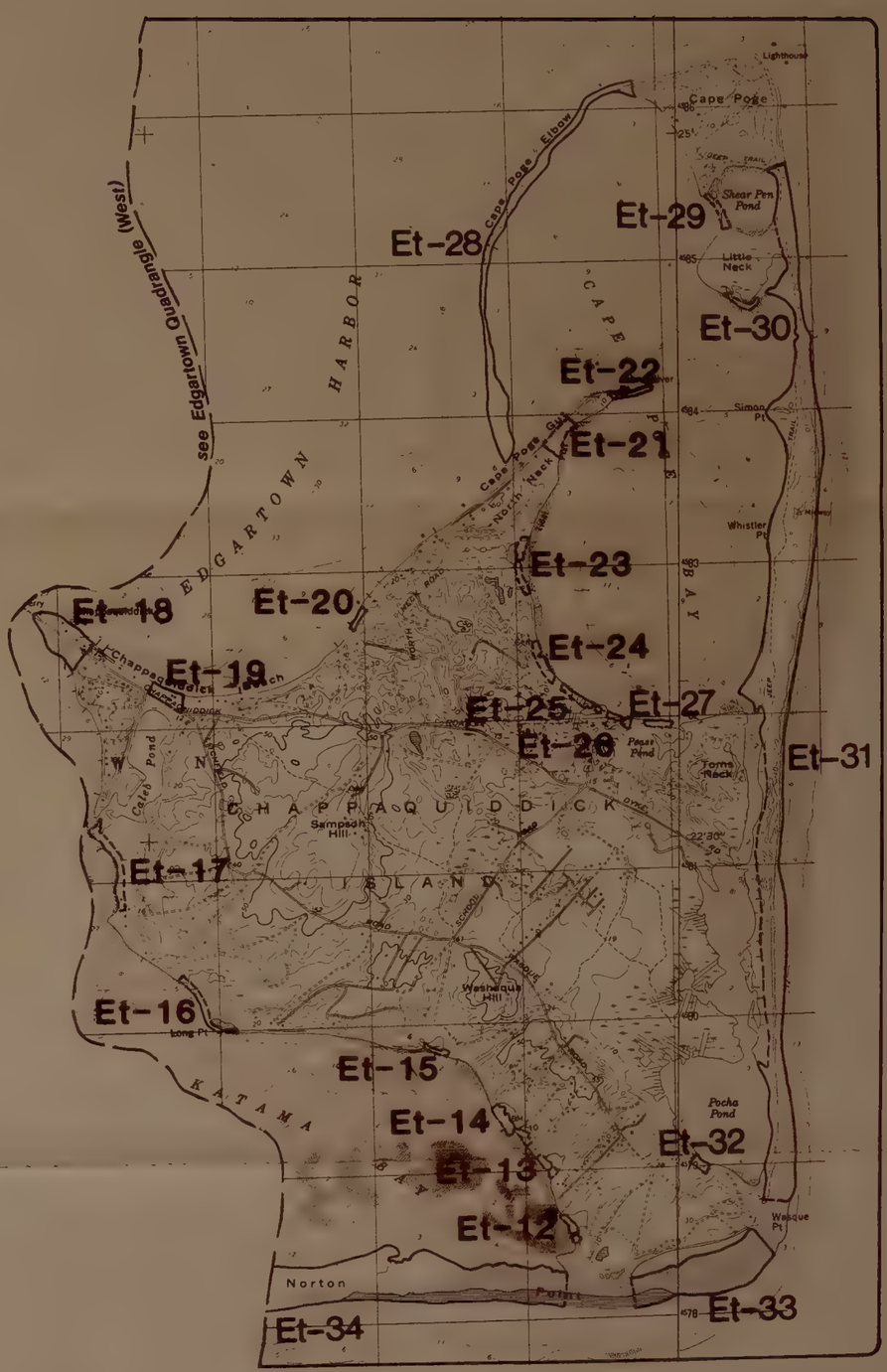

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Barrier Beach Unit Code System

Et–15
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

~~~ no contiguous marsh and/or tidal flats are present

-.-.- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Edgartown Quadrangle (East)
Massachusetts - Dukes County

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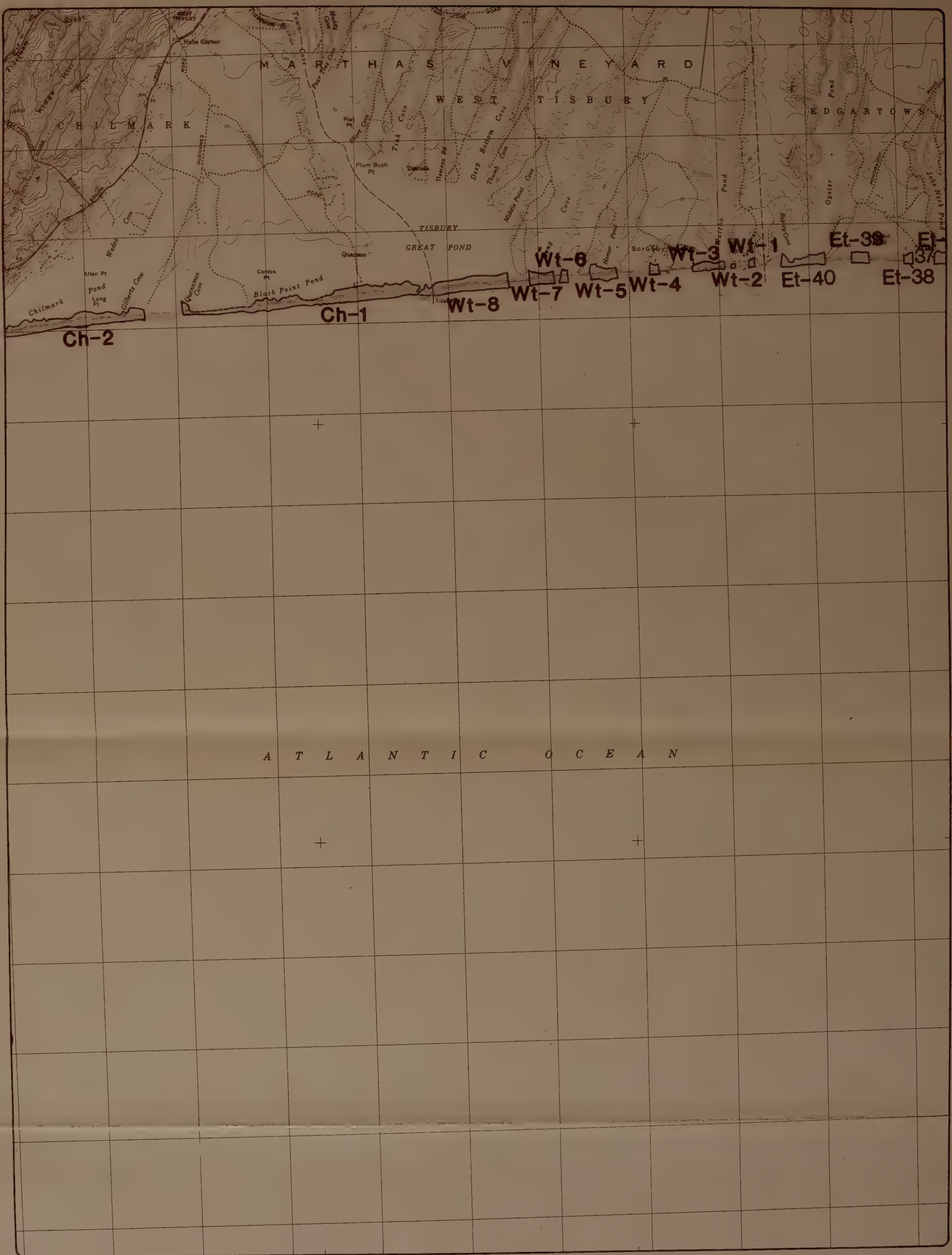

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Barrier Beach Unit Code System

Wt–8
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Tisbury Great Pond Quadrangle
Massachusetts - Dukes County

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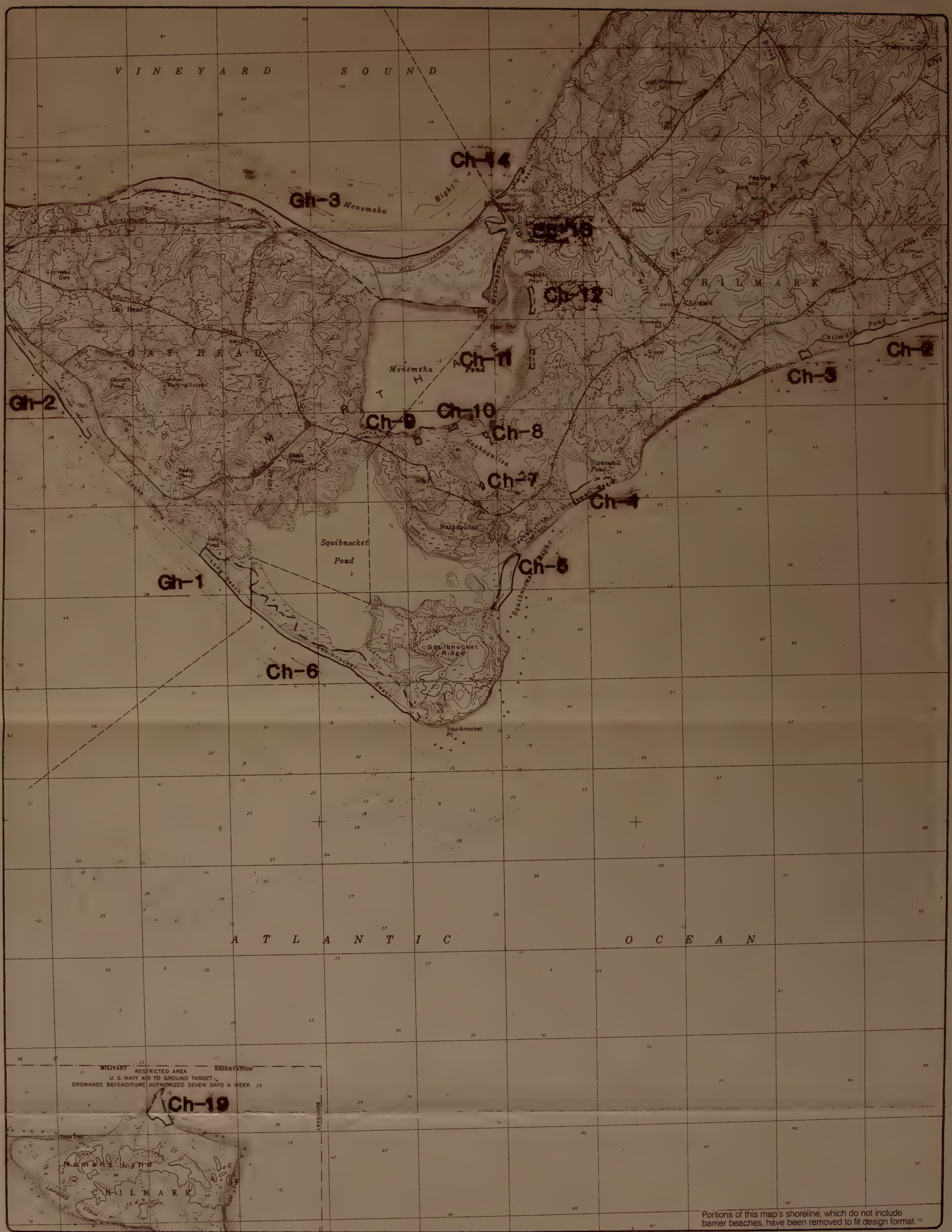

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Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Ch – 6
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Squibnocket Quadrangle
Massachusetts - Dukes County

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Barrier Beach Unit Code System

Nt – 48
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass.
Quadrangle Location

Tuckernuck Island Quadrangle
Massachusetts - Nantucket County

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Barrier Beach Unit Code System

Nt – 34
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

Scale in Feet 1:40,000

1000 0 1000 2000 3000 4000 5000

North

Mass
Quadrangle Location

Nantucket Quadrangle
Massachusetts - Nantucket County

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Department of Public Works, Massachusetts

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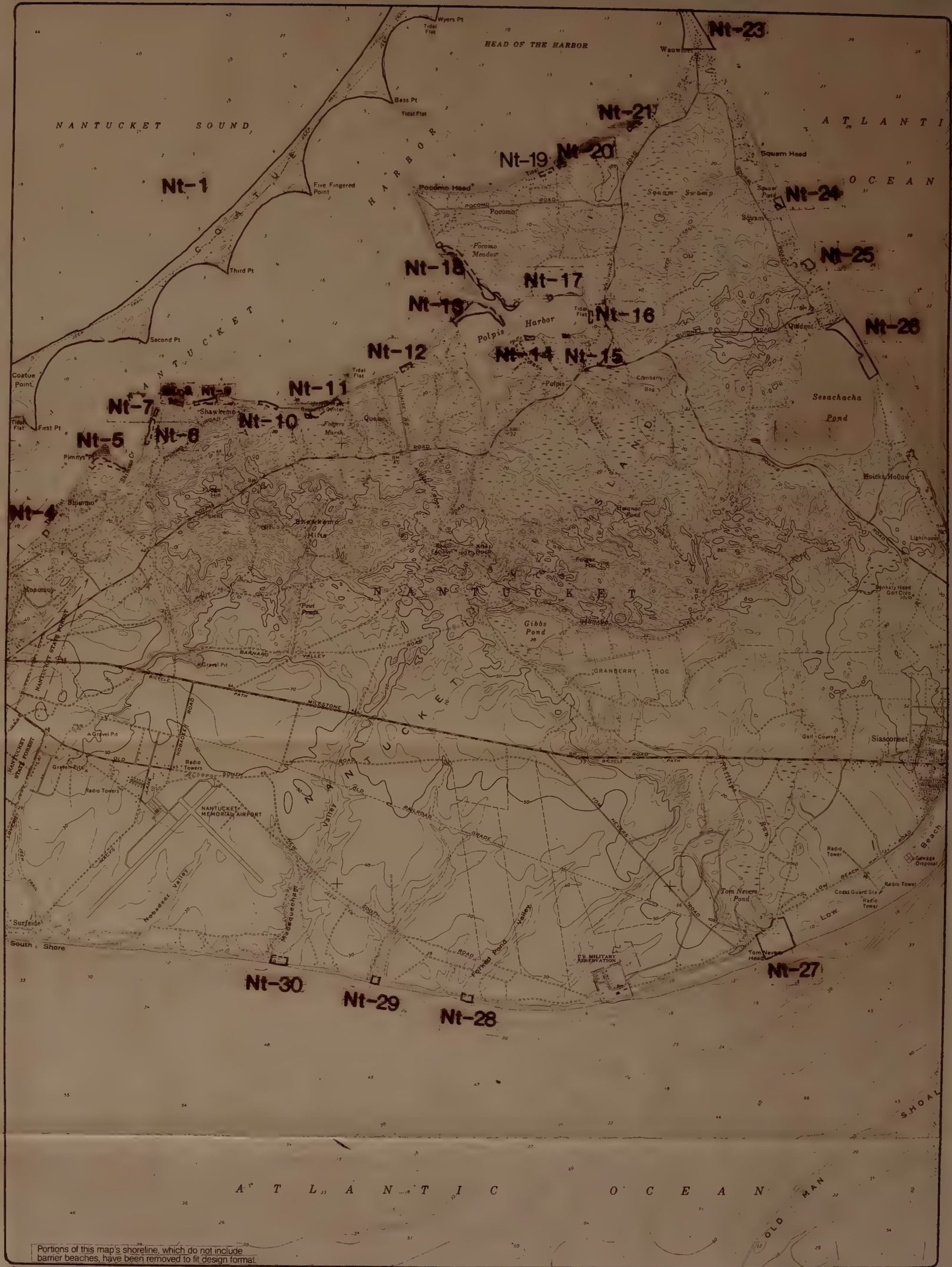

Portions of this map's shoreline, which do not include barrier beaches, have been removed to fit design format.

Barrier Beach Inventory Project

Executive Office of Environmental Affairs
Massachusetts Coastal Zone Management
Richard F. Delaney, Director

Project Coordinator: Gary Clayton
Geologic Advisor: Jeffrey Benoit

Maps depict Barrier Beaches subject to Executive Order No. 181.

Barrier Beach Unit Code System

Nt – 28
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass
Quadrangle Location

Siasconset Quadrangle
Massachusetts - Nantucket County

The geological field research and mapping was compiled and produced under contract with **The Provincetown Center for Coastal Studies**

Principal Investigator: Lester B. Smith, Jr.
Date of completion: April 1982

Base maps are U.S. Geological Survey Quadrangles - 7.5 Minute Series (Topographic)
Department of Public Works, Massachusetts

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Barrier Beach Unit Code System

Nt – 23
Town Barrier unit

Barrier Beach Margins

The seaward and landward margins of all barrier beach units extend to mean low water and include contiguous marsh and/or tidal flats.

- no contiguous marsh and/or tidal flats are present
- contiguous marsh and/or tidal flats are part of the barrier beach unit

North

Scale in Feet 1:40,000
1000 0 1000 2000 3000 4000 5000

Mass.
Quadrangle Location

Great Pond Quadrangle
Massachusetts - Nantucket County

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